

TANDY LAPTOP COMPUTING VOLUME 5, NUMBER 5 MAY 1988

portable 100

TANDY LAPTOP COMPUTING VOLUME 4

3.95

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ON
THE
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MAY 1988

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ROM WITH A VIEW

This is the start of Portable 100's new look. Each month for the next several month's you'll see a few more changes and improvements in the articles and the magazines appearance.

You may already have noticed the increase in material about the Tandy 200 (*The Custom 200* department, for example) and mention of articles coming in the Tandy 600. I can tell you we have some dynamite articles coming in the future on all of Tandy's notebook computers, things about the bar code port on the 100/102/200, disk programs for the 600, and construction articles that are easy enough for everyone, even novices who have only rarely touched a soldering iron.

Many of our readers have lamented the fact that so little advertising seems to be in the magazine and begging us to tell the vendors that the readers want to see more advertisements. Part of the reason you don't see more advertisements is that there just aren't a lot of vendors out there who support the Tandy notebook computers. Plus, the high cost of buying advertising space scares off many potential vendors who might be interested in boot-strapping a home-based hobby into a business.

To alleviate that problem this issue inaugurates the premier of the *Portable 100 Classifieds*. This is an inexpensive forum for people who have items they wish to sell to reach other readers who might be interested in buying. After testing the water with these small advertisements, a successful vendor could move up to another innovation from us: the ninth-page advertisements. These small display advertisements are approximately 2.25-inches wide by 3-inches high and will be available for as little as \$99 each on a twelve-times contract. For more information on the Classifieds, I refer you to the last page of this issue. For more information on the ninth-page advertisements, you should call Randy Byers at 603-924-9455.

Well, that's all for the moment. We'll keep you posted on any other new developments (by the way... Did you hear that Tandy bought Grid Systems, the manufacturer of the Rolls-Royce of MS-DOS laptop computers?).

-Terry Kepner

Toolbox

Manuscripts were typed into Microsoft Word 3.0 on a Tandy 1400 LT (dual drive, 640K), where they were edited, spell-checked, and had basic format instructions inserted. From there they were loaded into a Tandy 4000 (80386 CPU, Tandy EGA Monitor, Tandy LP-1000 LaserPrinter) desktop computer and placed into Aldus' IBM PageMaker 1.0A. There they were dummied into a rough approximation of the magazine's final appearance. Here, pull quotes are placed, headlines, intros, and bylines are sized and positioned, and advertisements are allocated space.

Next, the magazine (divided into sections) was ported over to Diana Wallace's Macintosh Plus, using the

1400 LT and Mac-link. Diana then went over the publication using Aldus Macintosh PageMaker 2.0A, page-by-page, making final design decisions on photo, figure, and listing sizes and placements. She precisely placed the text and added all the little things that go into making a nice looking publication.

Approximate page previews were output from her Apple LaserWriter Plus. When everyone was satisfied with the appearance, the Macintosh disk was sent to Colorite Corp. in Wisconsin for final output directly onto film (and in some cases, photographic paper). The film was then delivered to the printer, who printed it, labeled it, and mailed it.

PRESIDENT/PUBLISHER

Terry Kepner

EXECUTIVE VICE PRESIDENT

Mark Robinson

OPERATIONS CO-ORDINATOR

Marlene Butland

EDITOR-IN-CHIEF

Terry Kepner

EDITORS

JoAnn Niemela, Linda Tiernan

CIRCULATION MANAGER

David Warner Wallace

ADVERTISING DIRECTOR

Randy Byers

TECHNICAL CONSULTANT

Gregory F. Resker

DESKTOP PUBLISHING

ACROSS THE BOARD

Graphic Design, Inc.

ART DIRECTOR

Diana Shonk Wallace

PORTABLE COMPUTING INTERNATIONAL CORPORATION

145 Grove St. Ext., #21, PO Box 428
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The Missing Link in *The Missing Link*

The article *The Missing Link* by Dr. Rudy Kokich, indeed has a missing link.

On page number 19, the Doctor writes about a figure two and lines of programming that don't exist. I thought you had an excellent program. I am disappointed.

You have a good magazine. Please Keep it that way!

Morris Harris
Washington DC

As many others have said, I am an almost original subscriber to *Portable 100* and am very glad to see this magazine remain in publication. In the February 1988 issue I was really impressed with the program written by Rudy E. Kokich, *THE MISSING LINK*. It is both tightly reasoned and complete.

The trouble is I'm having difficulty understanding it entirely. Particularly, I can't find Figure 2 listed on page 19. Also I'm not familiar with using *PEEK's* and *CALL's*. "*CALL 17001* for example in program line 12. Also where is the "100byte subroutine located at the end of line 5 and in line 8".

To me this is a very good program that might be used as a program teaching example. Would you consider explaining it more thoroughly in a later article? If not that, can you print its "Figure 2" and better identify/explain the crucial "100 byte subroutine"?

William J. Spry
Youngstown, NY

Oops. In the rush to put out that issue, we somehow forgot that figure. Sorry for any inconvenience. Here it is as figure 1.

Eds.

MORE NUMBERS, LESS WORDS

My major areas of interest are business applications, stock market, financial applications. Most of your applications seem to be word oriented. How about giving *number people* a little input, too.

R. Flowers
Wichita, KS

We're working on it.

Eds

FRACTIONS IN THE WOOD SHOP

It is wonderful to receive *Portable 100* again. In the past I have learned a great deal from this magazine and have been directed to many useful peripheral products and programs. Hopefully, that shall continue.

The article in the February issue, entitled *FIF Is Alive and Well*, by Gene Burriss, intrigued me because, having a small home wood shop, I have found considerable use for a fraction solving program. While Mr. Burriss' program is very interesting, it is limited to only those fractions that are the standard parts of an inch. Viz: halves, quarters, eights and sixteenths.

Enclosed is a listing of a program that I developed some time ago for my PC-2 pocket computer, which I use whenever I work in my shop. (I

don't like the idea of getting sawdust into my Model 100's keyboard.) But, since I draw my plans in my den, I adapted the same program to my Model 100.

My program differs from Mr. Burriss' in that it will add, subtract or multiply any fraction by any fraction. Because radical numbers are too easily created when multiplying or restricted to a whole number, I have also restricted the division answer to no finer than 128ths. After all, in a wood shop it is impossible to measure to a 128th and it is surely impossible to saw any closer.

Also, in a wood shop, feet are seldom used. Almost all measurements are in inches and fractions of an inch. so, my program does not provide an entry for feet, nor does it reduce feet to inches.

This program also provides the opportunity to do a sequence of problems. As an example, adding the width of a saw blade to the length of a piece needed and then multiplying by the number of those pieces desired so that I can get a board that is long enough.

Warren S. Gibson
Olympia, WA

Thanks for your support and the opportunity to share your program. We've listed it here as figure 2.

Eds

```
100 CLS:LINE INPUT"Enter Equation, f(X) = ";B$
101 IF INSTR(B$,"X")+INSTR(B$,"x")>0 THEN LINE INPUT"Enter X Value, X = ";X$:X=VAL(X$)
102 A$="Y="+B$+CHR$(0)
103 A=VARPTR(A$)
104 B=PEEK(A+1)+256*PEEK(A+2)
105 CALL 1606,0,B
106 CALL 2499,0,63105
107 PRINT"Result of f(X) = ";Y
```

Figure 1. The missing Figure 2 from February's *The Missing Link* article


```

1000 CLS:LETP$="":PRINT@95,"Fractions":GOSUB1560
1010 GOSUB1350
1020 GOSUB1560
1030 LETX3=X1/X2:LETX4=X+X3:LETA=X4
1040 PRINT@175,"+", "-", "*", "/"
1050 A$=INKEY$:IFA$="" THEN1050
1060 IFA$="+" THEN1110
1070 IFA$="-" THEN1170
1080 IFA$="*" THEN1240
1090 IFA$="/" THEN1300
1100 GOTO1040
1110 GOSUB1350
1120 GOSUB1560
1130 LETX3=X1/X2:LETX4=X+X3:LETB=X4:LETC=A+B
1140 GOSUB1400
1150 GOSUB1470
1160 GOTO1500
1170 GOSUB1350
1180 GOSUB1560
1190 LETX3=X1/X2:LETX4=X+X3:LETB=X4
1200 IFA>B THENLETC=A-B:GOTO1210
1210 GOSUB1400
1220 GOSUB1470
1230 GOTO1500
1240 CLS:PRINT:INPUT"Whole No.:";B
1250 LETC=A*B
1260 GOSUB1400
1270 IFBB=0 THENLETB=0:LETC=0
1280 GOSUB1470
1290 GOTO1500
1300 CLS:PRINT:INPUT"Whole No.:";B
1310 LETC=A/B
1320 GOSUB1400
1330 GOSUB1470
1340 GOTO1500
1350 CLS:PRINT:INPUT"Whole NO.  ":";X
1360 INPUT"Numerators ":";X1
1370 INPUT"Denominators ":";X2
1380 CLS:PRINT@94,X;" ":";X1;" ":";X2
1390 RETURN
1400 LETZ=2
1410 LETY=INT(C):LETA=Y
1420 LETY=C-Y
1430 IFZ>128 THENLETP$="":GOTO1460
1440 LETY1=Y*Z:LETY2=INT(Y1):LETY3=Y1-Y2
1450 IFY3=0 THEN1460 ELSELETZ=Z+1:GOTO1430
1460 LETBB=Y1:LETC=Z:RETURN
1470 CLS:PRINT@93,"=";AA;" ":";BB;" ":";CC;P$
1480 A$=INKEY$:IFA$="" THEN1480
1490 RETURN
1500 CLS:PRINT@95,"More? Y/N:"
1510 A$=INKEY$:IFA$="" THEN1510
1520 IFA$="Y" ORA$="y" THEN1550
1530 IFA$="N" ORA$="n" THENMENU
1540 GOTO1500
1550 LETX=AA:LETX1=BB:LETX2=CC:GOTO1030
1560 FORT=1 TO350:NEXTT:RETURN

```

Figure 2. Fractions work for the woodshop worker.

SAVING FILES FROM A TANDY TO AN MS-DOS

After reading your response to people who want to know how to save files from a Tandy portable to an MS-DOS machine I thought you might be interested in a way to do it on a Model 100 without having to run *Telcom* or any other communications program. All you need is a null modem cable, DOS on the PC, and either the Text editor or Basic on the Tandy. Use the Text editor for .DO files or you can transfer a program directly to or from Basic on the Tandy. It will be saved on the PC as an ASCII file.

To save a file from the Tandy to the

PC do the following:

1. Type *Mode Com1:12, n,8,l,p* on the PC. (1200 Baud is the fastest rate that is reliable).
2. On the Tandy, load the file into BASIC or the TEXT editor.
3. Press F3 (Save)
4. For TEXT type *COM:58N1E* (Do not press *ENTER* yet) For Basic type *Com:58N1E* (Do not press *ENTER* yet)
5. On the PC type *COPY COM1:FILENAME.EXT* and press *ENTER*. (At this point you will sometimes get a "General failure reading Device Com1:". Typing "R" will usually do the trick and you will get a blinking cursor.)
6. Now, press *ENTER* on the Tandy. The file will be sent to the PC. When it has been transferred, the light on the disk drive will come on and the message "1 file(s) copied" will appear. The cursor will also reappear on the Tandy. Sending a file from the PC to the Tandy is just

slightly different.

1. If you have not already done so, give the Mode command in Step 1 above on the PC.
2. Type *COPY FILENAME.EXT COM1:* on the PC (Do not press *ENTER* yet).
3. Go into the TEXT editor or BASIC on the Tandy. If you are using the text editor you must name the file you are receiving.
4. Press F2 (Load)
5. For TEXT type *Com:58N1E* (and press *ENTER*) For BASIC type *Com:58N1E* (and press *ENTER*)
6. Press *ENTER* on the PC. When the file has been sent to the Tandy you will get "1 file(s) copied" on the PC.

7. Press *SHIFT BREAK* on the Tandy. In the TEXT editor the files will appear. In BASIC you will get "IO ERROR" followed by "OK" and ^C. List the program to see that it is there and you can save it to memory.

An important thing to keep in mind is that after the commands are given on both machines, press *Enter* first on the machine that is to *RECEIVE* the file. These instructions may seem a bit lengthy but after you do it a few times you will find it is really quite simple and fast.

In the November 1987 issue of *PICO Magazine* was an article by Paul Silagi called *Control That Printer* in which he gave two pokes for the Tandy 100/102 which would add line feeds when printing out a file thus eliminating the need to change any switches on your printer. (POKE 64228,127:POKE 64229,248 was supposed to turn it on and POKE 64228,243:POKE64229,127 would turn it off.) All it did was lock up my computer and I had to turn off power to the memory to get it started again. I would appreciate it if you could tell me what went wrong or what the correct POKES should be. I would also be interested in knowing if there is a book available, beside the Technical Reference showing addresses to *PEEK*, *POKE* and *CALL*.

David Riebert
Sparks,NV

Paul was wrong. He apparently had a linefeed routine in RAM at location 63615 that automatically inserted linefeeds with carriage-returns, and forgot about it. Hence his suggestion. Without that routine in place your computer simply locks up. Try the routine in figure three (or figure four if you have a 200).

These programs set HIMEM to eleven bytes (nine on the 200) less than MAXRAM and load the linefeed routine into those locations. If you want to use a machine-language program that changes the HIMEM value and loads over the linefeed routine, then you must rerun this program and disable the linefeed routine. When disabled, the normal 100/200

print routine operates (that is, no line-feeds). Otherwise your computer will reset to 1900 when you try to print and the print routine tries to execute the now non-existent linefeed routine.

Eds

AN 800 NUMBER FOR THE BBS?

I have just received my February issue of *Portable 100*. It is one of the magazines I subscribe to that I especially look forward to receiving.

In your *Rom With A View*, you mention the PBBS system you have set up. I would like to access this bulletin board at times but I fear my wife would not appreciate the telephone company costs. Is there any chance that in the near future you will have a toll-free, 800 number?

Joseph C. Strolin
Norwalk, CT

An 800 line to our BBS would cost over a thousand dollars a month, which is a huge expense. The only way we could do this would be to charge people for access to our BBS. Do y'all think that's a good idea?

Eds

COMPLETE LISTING OF ALL SOFTWARE?

Are there any companies that you can write to to receive a complete or close to complete listing of all software available for the Model 100.

I was also wondering if there are any Bulletin Boards that you can hook up to for the Model 100.

Gary Jeppesen
Shelby, MT

Nope, no one-source for all that, yet. We're probably going to be running a column on both subjects soon.

Eds

AUSTRALIAN PROBLEMS

I have a Model 100 (32K) with Disk/Video interface, Scriptsit 100 Disk Data Manager System. Portable Computing with the Model 100 Tel-

com has been modified to suit the Australian voltages.

How can I upload files direct (RS 232) to a P.C.?

Is the disk drive unit compatible with any other Tandy machine?

Can I expand the memory?

Why won't Scriptsit save to disk?

```
10 'lptlf -- add line feeds to lpt
20 'copyright 1983
30 ' Michael M Rubenstein
40 P=PEEK(64228)+256*PEEK(64229)
50 IF P=32755 THEN 100
60 PRINT "LPTLF enabled. Disable? ";
70 C$=INPUT$(1):PRINT C$;IF C$="y" OR C$="Y" THEN
POKE64228,243: POKE 64229,127: CLEAR 256,MAXRAM
80 MENU
100 CLEAR 256,MAXRAM-11: P=INT(HIMEM/256): POKE 64229,P:
POKE 64228,HIMEM-256*P: P=HIMEM
110 READ B: IF B>=0 THEN POKE P,B: P=P+1: GOTO 110
120 MENU
150 DATA 254,13,192,62,10,205,63,109,62,13,201,-1
```

Figure 3. Add linefeeds to your carriage-returns when printing from your Tandy 100.

Robert Ripley

Endeavour Hills, Victoria

The Disk/Video drive unit works with the Tandy 100 and 200. Scriptsit 100 wasn't designed to work with the PDD. As for uploading files direct: Get an RS-232 null-modem, plug it into the P.C. Use TELCOM on the Tandy 100 and any communication's software on the P.C.

For memory Expansion, check the advertisements from Traveling Software, Purple Computing, and Sound-Sight.

Eds

CRUISIN WITH 12 VOLTS

Just finished reading the timely article *Cruisin' with the Model 100* by

```
10 DATA 254,13,192,205,201,132,62,10,201
20 CLEAR 20,HIMEM-9: AD = HIMEM
30 FOR I = 0 TO 8: READ D: POKE AD + I,D: NEXT
40 POKE 62740,INT(AD/256)
50 POKE 62739,AD - PEEK (62740)*256
60 PRINT "Line Feed Patch Address =";AD
70 'Line Feed Patch For TANDY 200
71 'By Jim Irwin - 72346,1020
78 'TO DISABLE:
79 'POKE 62739,168
80 'POKE 62740,156
```

Figure 4. Add linefeeds to your carriage-returns when printing from your Tandy 200.

Ralph Tenny. The diagram in figure 1 contains a very common error. As shown it appears that one needs a 24 volt supply. Obviously, Mr. Tenny is using a car with a 12 volt supply. Therefore, the lower connection

should indicate "-" or ground, or body, and not "-12V". The diode D1 should not be optional as it provides protection against accidentally using the adapter in a car with reverse battery polarity connections.

Have enjoyed Portable 100 in the past and am pleased to see it back again.

Sam Lewbel
Sun City, AZ

CLEVER RUDY KOKICH

I'd like to congratulate Rudy Kokich as on his excellent CALC-I pro-

gram that appeared in the February 1988 issue of *Portable 100*, and applaud your editorial decision to print it. This is exactly the kind of software one hopes to find for the 100: useful, compact, user-friendly and cleverly done. It will be a permanent addition to my 102.

Because I use UltraScreen I thought I'd pass along a tip that is useful with programs that use the BASIC PRINT@ command to format the screen, as CALC-I does.

Because the PRINT@ command counts characters from left to right from the upper left hand corner, its fairly easy to modify any program to work correctly whether or not Ultrascreen's 60X10 mode is active. Here's how to do it:

1. Replace the numbers in all PRINT@'s in the program with variable names. Use a different variable name for each different @number, and pick variable names that are not already in use in the program. For instance, if the program contained four PRINT@'s:

```
PRINT@0,.....:PRINT@40,....
PRINT@280,....:PRINT@280,....
```

```
you could change these lines to:
PRINT@0,.....:PRINT@P1,....
PRINT@P7,....:PRINT@P7,....
```

assuming P1 and P7 are not already used in the program. Obviously, there is no need to change a

PRINT@0, as this screen location is the same upper left hand corner position on either screen.

- Having made all the PRINT@'s refer to variables, add a line of code at the beginning of the program to set the correct values into the new variables. The general formula for the new variables is: $PN = LL * (40 + PEEK(63032) * 20) + PP$ where LL is the line position on the eight line screen, (0 to 7), and PP is the character position on the line (0 to 39). In the example above, the line of code would read:

$P1 = (40 + PEEK(63032) * 20)$

$:P7 = 7 * (40 + PEEK(63032) * 20)$

or more compactly:

$P1 = (40 + PEEK(63032) * 20) : P7 = 7 * P1$

Because memory location 63032

contains the screen mode, a 0 for the normal 8x40 screen, or a 1 for the 10x60 screen, the above lines toggle the line length between 40 and 60, and a program using PRINT@'s will give a correct displaying either mode. The display screen in 10x60 mode will be located in the upper left corner of the display, however, and will still only use forty character positions per line.

Mike Aiello

Croton-on-Hudson, NY

Thanks very much Mike for your advice and tips.

Eds

WE HAVE BUGS IN OUR BAR-CODE

In your February 1988 issue of *PORTABLE 100*, you were kind enough to publish my article Using the Model 100 Barcode Reader as a Tachometer/Counter. It was not until publication that I discovered a bug in the programs. My reasoning in writing the programs presented, was that probably few readers with a Model 100 and bar code reader would have machine tools in their shop. This led to programs that give answers with a high percentage of error at record player speeds. This is due to two con-

siderations: (1) There is no number of seconds that divides into 300 at record player speeds and gives an accurate reading of RPM except 33 1/3, but: (2) The time, as given in BASIC, is an integer number to the nearest second only. I said I was not a Math whiz! I'm sure that we will hear from the whizzes out there.

However, I am including with this a simple BASIC program, that gives results within plus or minus one revolution. The program counts bar passages of 60 seconds and then prints RPMs. The paper on the turntable should have a single, black radial line. I fasten the wand to the non-revolving spindle in the center of my turntable. A minute is a long time to hold the wand against the

```

0 CLS
1 CALL 16959
2 C=0
3 ' "TACH2.BA" BY: Frank W. Schrader, February, 1988
5 TIMES="00:00:00"
6 IF TIMES="00:01:00" THEN PRINT@ 170,C:PRINT@ 180,"RPM":GOTO 2
10 IF 8 AND INP(187) THEN GOTO 6:GOTO 100 ELSE 100
90 GOTO 2
100 IF TIMES="00:01:00" THEN PRINT@170,C:PRINT@ 180,"RPM":GOTO 2
110 BEEP
115 C=C+1
120 GOTO 6
500 *****
510 ***** TO REINSTATE SCROLLING, WHILE *****
520 ***** IN BASIC, TYPE CALL 16964, HIT ENTER *****
530 ***** OR TURN THE COMPUTER OFF AND THEN ON AGAIN. *****
540 *****

```

Figure 5. Corrections to TACH.BA from the February 1988 issue.

paper. If greater accuracy is required, it probably would be a good idea to buy a cheap tachometer, unless, of course, you just want to fool around with new uses for the bar code wand and the Model 100.

Frank W. Schrader
Sarasota, FL

Thanks for the update. Sorry about any inconvenience folks. See figure five for the updated program.

Eds

PROGRAMS FROM THE AMERICAN RADIO RELAY LEAGUE

Of interest to some of your subscribers might be the free programs offered by the American Radio Relay League for the Model 100.

A list of all programs available can be had by sending an SASE to:

A.R.R.L.
Dept PX
225 Main Street
Newington, CT 06111

Currently there are about 49 programs available, about six for the Model 100. These programs have to do with Amateur Radio, antennas and electrical.

Joseph C. Strolin
Norwalk, Ct.5

MORE PROGRAMS

I was very disturbed by Louise Legeza's letter in the I/O section of your February issue, and felt I had to write to express my views.

To begin with, I want more programs, not fewer. Good programs are the reason I buy your magazine. Reviews have a place, too, but don't take space away from programming articles to include them. The February review of Ultrascreen was good and I look forward to some of the other reviews you have planned, but one a month is enough.

I don't need or want tutorials on how to use the built-in Model 100 software. I can't understand how Ms. Legeza can call the Model 100 manual *lousy*. It is quite clear and does indeed have step-by-step instructions on how to use the various applications. Both *SCHDL* and *AD-DRESS* have sample sessions that guide you through the programs in a logical manner. Don't use your pages to simply re-iterate information that can be found in the manual.

Which brings me to the types of articles and programs I want to see. If anything, I want more technical information, written by people who know what they are doing. The best articles are those that are written by someone who has solved a *real-world* problem with his Model 100 and is willing to share the information.

For example, Dr. Kokich's article on using the computer as a calculator

was very good. He wrote a very useful program and by publishing it has given the rest of us a new tool. Now that I have entered the program I can do things with my Model 100 that I couldn't do before. That's what I want from your magazine.

The same applies to Frank Schrader's tachometer article. I didn't know I could do that. But now my computer is more valuable to me.

On the other hand, Richard Dickson's article on typefaces was a complete waste of space. You can sum up the article in a single sentence: "Use the commands found in your manual to change typefaces on your printer." There was nothing new here. You can get exactly the same information simply by reading the manual.

I think that is the key to making progress with any piece of computer equipment: Read the blasted manual. Some of them are less than entirely lucid, but if something isn't clear try it. Experiment. You're not going to hurt anything by playing around at the keyboard. Hands-on experience is the best way to learn.

I don't have any problem with your authors writing over my head. Most of the time I understand exactly what they're saying, and if not, a few minutes spent playing around with the program makes it clear. An author writing for a publication such as yours has to assume a certain amount of competence on the part of his readers. It would be wasteful and foolish to define standard terms such as *default* and *ASCII* in every article. Most of us know what those mean. Those who don't can easily find out. Any public library has a large number of computer books that will guide the novice toward a firm grounding in the technical aspects of computers.

And make no mistake, computers are technical. You have to make an effort to understand at least the rudiments of their operation or you will never get anywhere. Even just getting a program into the computer requires some knowledge of how the

things work.

Don't lower the standards of your articles just because not everyone understands them. I don't understand everything either, but if it is something I'm interested in, I'll do my best to figure it out. Knowledge is synergistic. It isn't necessary for every article to be completely self-contained. Bits and pieces of information from many sources build up a picture of expanding awareness.

Ms. Legeza seems to acquaint technical terms with *gobbledy-gook*. That just isn't true. It is simply the language of writing about computers. Mathematicians explain things in terms of mathematical symbols; lawyers use legal terms, and economists deal with supply and demand curves, point elasticity, and marginal tax rates. Authors who write for computer magazines use technical computer terms. There is absolutely nothing wrong with that.

Of course, if you can't understand the language you are going to be confused and frustrated, but that isn't the writer's fault. The reader who can't understand what is being said needs to do his/her homework. Read the manuals, check out computer books from the library, and experiment with hands-on experience.

Some magazines have a *Beginner's Forum* that tries to introduce new users to the computer, but this is somewhat futile. There are always going to be novices coming into the field and unless you keep covering the same information over and over again, someone is going to complain that you aren't dealing with the basics. You would serve your readers better by directing them to beginner's books about the Model 100 (there are several of them) so that they can learn what they need to to get the most out of your articles.

You might also consider a *Consultant's Corner*. Instead of taking space to publish articles that cover rudimentary aspects of the Model 100, use a column or two to publish names and addresses of readers who

are willing to help novices learn the ropes. If you also included each person's area of expertise or interest, even experienced users would have a resource to turn to if they need help.

I'd be more than happy to add my name to such a list. I love my Model 100 and enjoy sharing what I know. I've written magazine articles before and anyone who sends me a question with a SASE gets a reply. I enjoy answering mail and often times I learn something as well.

This has been a long letter, but let me summarize my points.

First, I want more programs. I want articles that teach me how to do something with my Model 100 that I didn't know how to do before. Don't publish information that can be readily found in the manuals. Let's have articles that push the computer beyond the built-in applications.

Next, don't worry about being too technical. The articles need to be clear and concise, but if they are technical, so be it. I don't want articles written by elementary teachers. I want articles written by authors that thoroughly understand their material.

Finally, don't gear your magazine toward novices. Don't ignore them, of course, but keep your focus on more advanced techniques and programs, things that can't be found elsewhere.

Of course, you can't please everybody. If you publish this letter there are certain to be readers who disagree with my views just as I disagree with Ms. Legeza. I am not insensitive to problems like hers, but I don't want a magazine that simply rewrites the manuals or is devoted to teaching the rudiments of my Tandy.

I buy your magazine to learn, to be challenged, to make my machine do what it couldn't do before. That means programs and technical articles. And if it means I have to work and stretch my understanding, so much the better. I'm willing to do that.

Michael A. Wilson
California, MD

The Slot Machine Game

Play the slots without the expense of a Las Vegas or Atlantic City trip!

by Ralph Sherman

The slot machine probably is the most profitable type of game operated by gambling casinos. An individual slot machine requires relatively little overhead and maintenance, takes a negligible amount of floor space, is on duty 24 hours a day and never asks for a pay raise. Yet slots take in millions of dollars a year, with much of the total coming from people who play for hours without a break.

There is a way, however, to play a slot machine all day without spending a cent. That way is SLOT.BA, a true-to-life simulation of an actual three-reel slot machine called the Twenty-One Bell.

THE TRUTH ABOUT SLOT MACHINES

Many people who have never played the slots believe that the machines are designed to take a player's money as quickly as is mechanically possible, and to keep most of the money that they receive. While that's the way that many illegal slots work, the truth is quite different for legal machines in legal casinos that must compete with each other for customers.

The Twenty-One Bell is a case in point. Although the machine is undoubtedly profitable for the casinos, in the long run it pays out 94.45 percent of its gross income. Further, with 8,000 combinations of symbols possible on the machine, and 1,073 combinations that win, a player on average will receive some payout 13.4 percent of the time.

MORE COMPLEX THAN THEY APPEAR

Another common misconception about slots pertains to the reels that spin and display pictures of fruit or other symbols. The Twenty-One Bell has eight different symbols, and many people believe incorrectly that each reel therefore has eight points at which it can stop.

```
1 ' SLOT.BA by Ralph Sherman [73720,3433
2 ' created 11/13/87 - revised 12/04/87
20 CLS:CALL16959:PRINT@134,"Sound (y/n
)"?
25 SO$=INKEY$:IFSO$<>"y"ANDSO$<>"n"THENA
=RND(1):GOTO25
30 CLS:DEFINTA:DIMY$(3),W$(3,20):ES$=CHR
$(27):WB$=ES$+"p":BW$=ES$+"q":AR$=CHR$(1
54):T$="SLOT":AL$=CHR$(155):B1=20:LS=20
32 LINE(99,21)-(145,33),1,B:LINE(97,19)-
(147,35),1,B:LINE(96,18)-(148,36),1,B
34 LINE(110,22)-(110,32):LINE(122,22)-(1
22,32):LINE(134,22)-(134,32)
36 FORX=1TO4:PRINT@135+2*X,MID$(T$,X,1):
IFSO$="y"THENSOUND0,1
38 NEXTX:PRINT@253,"by Ralph Sherman"
40 GOSUB550
48 '
49 ' get characters for the reels
50 X$=CHR$(55)+CHR$(36)+CHR$(157)+CHR$(1
28)+CHR$(134)+CHR$(158)+CHR$(180)+CHR$(4
2)
55 FORX=1TO3:FORX1=1TO20:READN:W$(X,X1)=
CHR$(N):NEXTX1:NEXTX
58 '
59 ' draw the machine
60 CLS:LINE(9,21)-(43,33),1,B:LINE(20,22
)-(20,32):LINE(32,22)-(32,32):LINE(7,19)
-(45,35),1,B
65 LINE(6,18)-(46,36),1,B:LINE(4,16)-(48
,63),1,B:PRESET(4,16):PRESET(48,16)
70 LINE(34,15)-(34,11):LINE(34,11)-(36,9
):LINE(36,9)-(39,9):LINE(39,9)-(41,11):L
INE(41,11)-(41,15)
75 PSET(37,14):PSET(36,13):PSET(36,12):P
SET(37,11):PSET(38,11):PSET(39,12):PSET(
```

continued

In fact, the Twenty-One Bell is typical in that each reel has 20 stopping places—and the reels are not identical. The first two reels, for example, have more of the higher-paying symbols and none of the lemons, which are worthless; on the third reel, however, five of the 20 stops are lemons. Thus the reels often will appear to stop just short of a winning combination—for example, with matching plums on the first two reels and a lemon on the third. Of course this design has the psychological effect of keeping a player interested in spending more money on the game.

The same effect is achieved by allowing the player, on average, to win something about every seven or eight times that he pulls the handle. Although the probability of winning a big payout is very small, the player's money doesn't simply disappear in a steady stream of silver dollars. Rather, the player's balance usually drops for a few plays, then rises slightly, drops for a few more plays, rises again, and so on. Smart players quit when they win big; others play until they're broke.

THE MODEL 100 SIMULATION

SLOT.BA differs from the real Twenty-One Bell machine in only two ways. First, because the Model 100 character set does not include symbols like plums, cherries and melons, SLOT.BA uses a different set of symbols. These are substituted directly for the symbols in the Twenty-One Bell as shown in Table 1. Second, at seven stops on the three reels of the Twenty-One Bell there are double symbols that would be impossible to present elegantly on the Model 100. For example, Stop 12 on Reel 2 shows both a melon and an orange; if Reel 2 stops at this point, the Twenty-One Bell counts the more advantageous symbol in determining the payout. That is, if the other two reels stop at melons, Reel 2 will count as a melon, too; if the other reels stop at oranges, Reel 2 will count as an orange.

When a reel stops at a double symbol in SLOT.BA, the program displays the symbol that is more advantageous to the player, or, if neither symbol would yield a winning combination, the program chooses one symbol or the other at random. A slight exception to this is Stop 8 on Reel

```

39,13):PSET(38,14)
77 FORX=1TO3:PRINT@120+2*X,"7":NEXTX
80 GOSUB580
83 '
84 ' draw the tally box
85 LINE(4,38)-(48,38):GOSUB520:PRINT@15,
W$;"TALLY";BW$:LINE(89,0)-(89,7)
90 LINE(76,14)-(132,63),1,B:LINE(76,63)-
(132,63),0:PSET(76,63):PSET(132,63):LINE
(77,13)-(133,13):LINE(133,14)-(133,62):G
OSUB600
95 GOSUB2100:GOSUB580
98 '
99 ' wait for <ENTER>, then spin the ree
ls
100 GOSUB2137:IFB=0THEN1000ELSEIFB>500TH
EN3000ELSEC0=0:A$=INKEY$:IFA$<>" "THENDU=
RND(1):GOTO100
110 A$=INKEY$:IFA$=CHR$(13)THEN1100ELSEI
FA$=ES$THENMENU
120 C0=C0+1:DU=RND(1):IFC0>200THENLINE(1
1,47)-(41,55),1,BF:C0=0:FORZT=1TO20:NEXT
ZT:GOSUB580
130 GOTO110
518 '
519 ' put the handle up
520 LINE(49,36)-(50,36):LINE(49,39)-(52,
39):LINE(51,36)-(51,20):LINE(53,38)-(53,
20):LINE(53,20)-(51,20):LINE(52,25)-(52,
21)
522 IFSO$="Y"THENSOUND2700,2
525 RETURN
528 '
529 ' pull the handle down
530 LINE(49,36)-(50,36),0:LINE(49,39)-(5
2,39),0:LINE(51,36)-(51,20),0:LINE(53,38
)-(53,20),0:LINE(53,20)-(51,20),0:LINE(5
2,25)-(52,21),0
535 PRINT@122," ":PRINT@124," ":PRINT@12
6," ":LINE(11,47)-(41,55),1,BF
540 LINE(49,36)-(52,36):LINE(49,39)-(50,
39):LINE(51,39)-(51,55):LINE(51,55)-(53,
55):LINE(53,55)-(53,37):LINE(52,54)-(52,
50)
542 LINE(37,12)-(38,13),0,B:IFSO$="Y"THE
NSOUND3600,2
544 GOSUB550

```

continued

TALLY		PAYOUT				\$ WILL
Now	\$20	—	—	—	2	
High	\$20	♣	♣	♣	10	
Low	\$20	♠	♠	♠	14	
Plays	0	2	2	2	18	
		♦	♦	♦	100	
		\$	\$	\$	100	
		7	7	7	200	

Table 1. The display on the Tandy 100/102, and the symbols used in place of the more traditional lemon, plum, cherries, and so forth.


```

545 LINE(49,36)-(52,36),0:LINE(49,39)-(5
0,39),0:LINE(51,39)-(51,55),0:LINE(51,55
)-(53,55),0:LINE(53,55)-(53,37),0:LINE(5
2,54)-(52,50),0:GOSUB520:RETURN
548 '
549 ' pauses - long and short
550 FORZT=1TO300:NEXTZT:RETURN
555 FORZT=1TO60:NEXTZT:RETURN
578 '
579 ' print logo on machine
580 LINE(11,47)-(41,55),1,BF:IFF0=0OR(B=
0ANDB1=0)THENF0=1:RETURNELSEPRINT@242,WB
$;"PLAY!";BW$
585 IFSO$="Y"THENSOUND5000,1:SOUND4700,1
590 RETURN
598 '
599 ' display the tally
600 PRINT@93,"Now"
610 FORS=BTOB1STEP(B1-B)/ABS(W1-B):PRINT
@97,"";:PRINTUSING"$S###";S:IFSO$="Y"THE
NSOUND0,1
620 NEXTS:B=B1
630 IFB>HSTHENHS=B
640 IFB<LSTHENLS=B
650 PRINT@173,"High";:PRINTUSING"$S#R#";
HS
660 PRINT@213,"Low ";:PRINTUSING"$S###";
LS
670 PRINT@293,"Plays ";:PRINTUSING"###";
P9
680 RETURN
998 '
999 ' if Balance = 0...
1000 PRINT@12,WB$;" GAME OVER ";BW$
1010 FORX=1TO3:PRINT@120+2*X,"X":NEXTX
1020 LINE(11,47)-(41,55),1,BF
1030 IFSO$="Y"THENFORX=5000TO16000STEP30
0:SOUNDX,2:NEXTX
1040 IFINKEY$<>" "THEN1040
1050 AS=INKEY$:IFA$=ES$THENMENU
1060 IFA$=CHR$(13)THENB=0:F0=0:B1=20:HS=
20:LS=20:P9=0:GOTO60
1070 DU=RND(1):GOTO1050
1098 '
1099 ' spin the reels
1100 LINE(37,12)-(38,13),1,B:GOSUB555:B1
=B-1:P9=P9+1:GOSUB600:GOSUB530:S9=4700
1110 FORN2=1TO3:I=RND(1)*20+1:J=RND(1)*2
0+1:K=RND(1)*20+1
1120 FORN1=1TOVAL(RIGHT$(TIMES,1))+7+3*R
ND(1):IFN2>1THEN1135ELSEI=I+1:IFI>20THEN
I=1
1130 PRINT@122,W$(1,I):IFSO$="Y"THENSOUN
DS9,1
1135 IFN2>2THEN1145ELSEJ=J+1:IFJ>20THENJ
=1
1140 PRINT@124,W$(2,J):IFSO$="Y"THENSOUN
DS9,1
1145 K=K+1:IFK>20THENK=1
1150 IFK<>15THENPRINT@126,W$(3,K)
1153 IFK=15THENPRINT@126,MID$("7$",RND(1
)*2+1,1)
1157 IFSO$="Y"THENSOUNDS9,1

```

continued

```

1160 NEXTN1
1170 ONN2GOSUB1200,1300,1400
1195 S9=S9-1300:NEXTN2:GOTO1500
1200 A=RND(1)*20+1:IFA<>8THENY$(1)=W$(1,
A)ELSEY$(1)="?"
1205 PRINT@122,WB$;Y$(1);BW$
1210 IFSO$="Y"THENSOUND0,1:SOUND8000,1:S
OUND10000,1:SOUND0,1ELSEGOSUB555
1220 IFY$(1)<>"?"THENPRINT@122,Y$(1)
1230 RETURN
1300 A=RND(1)*20+1
1305 N$=Y$(1)
1310 Y$(2)=W$(2,A):IFY$(1)="?"THENN$=MID
$(CHR$(128)+CHR$(36),RND(1)*2+1,1)
1313 IFY$(1)="?"AND ( Y$(2)=CHR$(128) OR
Y$(2)=CHR$(36) ) THENN$=Y$(2)
1315 Y$(1)=N$:PRINT@122,Y$(1)
{20 IFA=4AND( Y$(1)=CHR$(55) OR Y$(1)=C
HR$(158) ) THENY$(2)=Y$(1)ELSEIFA=4THENY
$(2)=MID$(CHR$(55)+CHR$(158),RND(1)*2+1,
1)
1325 IFA=7AND( Y$(1)=CHR$(134) OR Y$(1)=
CHR$(36) ) THENY$(2)=Y$(1)ELSEIFA=7THENY
$(2)=MID$(CHR$(134)+CHR$(36),RND(1)*2+1,
1)
1330 IF(A=12ORA=20)AND( Y$(1)=CHR$(157)
OR Y$(1)=CHR$(158) ) THENY$(2)=Y$(1)ELSE
IF(A=12ORA=20)THENY$(2)=MID$(CHR$(157)+C
HR$(158),RND(1)*2+1,1)
1340 PRINT@124,WB$;Y$(2);BW$
1350 IFSO$="Y"THENSOUND0,1:SOUND8000,1:S
OUND10000,1:SOUND0,1ELSEGOSUB555
1360 PRINT@124,Y$(2):RETURN
1400 A=RND(1)*20+1
1410 Y$(3)=W$(3,A)
1420 IFA<>15THEN1430
1425 IFY$(2)=CHR$(55)ORY$(2)=CHR$(36)THE
NY$(3)=Y$(2)ELSEIFY$(1)=Y$(2)THENY$(3)=C
HR$(36)ELSEY$(3)=MID$(CHR$(55)+CHR$(36),
RND(1)*2+1,1)
1430 IFA<>18THEN1440
1435 IFY$(2)=CHR$(157)ORY$(2)=CHR$(158)T
HENY$(3)=Y$(2)ELSEY$(3)=MID$(CHR$(157)+C
HR$(158),RND(1)*2+1,1)
1440 PRINT@126,WB$;Y$(3);BW$
1450 IFSO$="Y"THENSOUND0,1:SOUND8000,1:S
OUND10000,1:SOUND0,1ELSEGOSUB555
1460 PRINT@126,Y$(3):RETURN
1498 '
1499 ' check for winning combinations
1500 GOSUB550:ONINSTR(X$,Y$(1))GOTO3000,
3020,3040,3060,3080,3100,3120
2008 '
2009 ' characters for Reel 1
2010 DATA158,157,134,180,134,158,55,128,
158,180,36,134,158,134,157,134,158,134,3
6,134
2018 '
2019 ' characters for Reel 2
2020 DATA180,134,180,55,180,128,134,128,
180,158,128,157,134,128,180,36,158,180,1
28,157
2028 '
2029 ' characters for Reel 3
2030 DATA128,158,134,128,158,42,128,42,1

```

continued

1, which appears as a question mark until Reel 2 stops spinning; before Reel 2 stops, the program cannot determine which symbol on Reel 1 would be advantageous.

Otherwise, the winning combinations, the payouts, and the sequence of symbols on the reels is simulated faithfully by SLOT.BA.

HOW TO PLAY

When you run SLOT.BA, the program asks you whether you want the game to be accompanied by sound effects. After you press *y* or *n* (lower case), the screen clears and displays the title of the program. The screen clears again after a few seconds.

The program next draws a slot machine at the left of the screen, a tally box near the center of the screen, and a payout table at the right. If you asked for sound effects, you'll hear them begin as the slot machine is drawn.

The tally box shows, from top to bottom, your current balance (*Now*), your highest balance during this game (*High*), your lowest balance during this game (*Low*), and the number of times you have pulled the handle (*Plays*). The program always gives you a starting balance of \$20; to determine how much money you have won during a game, add your *Now* balance to the number of plays, and subtract 20.

The program always gives you a starting balance of \$20

To pull the handle, press *ENTER*. A coin will be shown entering the slot at the top of the machine; your *Now* balance will decrease by \$1; your *Low* figure may decrease, too; and the number of *Plays* will increase by one.

The reels will appear to spin for a short time and then stop, flashing in reverse video for an instant before each reel comes to rest. If a non-winning combination is shown, the logo box on the machine will say *SORRY!*, and a low tone will be sounded if you have asked for sound effects. The logo box will then change to urge you to *PLAY!* another dollar.

If a winning combination is shown, the logo box will say *U WIN*, and arrows will appear in the payout table to point out the winning combination and the payout amount. Figures in the tally box will change accordingly, and a musical announcement will be sounded if you asked for sound effects.

As is indicated in the right-hand border of the payout table, the dollar sign (\$) counts as a *wild card*. Specifically, a dollar sign on Reel 3 with a pair of hearts, gifts, tele-

```

28,134,42,128,134,128,55,42,128,157,128,
42
2098 '
2099 ' display the payout table
2100 PRINT@27,WB$;" ";BW$;" ";CHR$(180);
" - - 2 ";WB$;" "
2105 PRINT@67,"P";BW$;" ";CHR$(180);" ";
CHR$(180);" - 5 ";WB$;"$"
2110 PRINT@107,"A";BW$;" ";CHR$(158);" "
;CHR$(158);" ";CHR$(158);" 10 ";WB$;" "
2115 PRINT@147,"Y";BW$;" ";CHR$(134);" "
;CHR$(134);" ";CHR$(134);" 14 ";WB$;"W"
2120 PRINT@187,"O";BW$;" ";CHR$(128);" "
;CHR$(128);" ";CHR$(128);" 18 ";WB$;"I"
2125 PRINT@227,"U";BW$;" ";CHR$(157);" "
;CHR$(157);" ";CHR$(157);" 100 ";WB$;"L"
2130 PRINT@267,"T";BW$;" $ $ $ 100 ";WB$
;"D";
2135 PRINT@307," ";BW$;" 7 7 7 200 ";WB$
;" ";
2137 LINE(161,0)-(161,63):LINE(233,0)-(2
33,63)
2140 RETURN
2996 '
2997 ' check for winning combinations
2998 '
2999 ' three sevens?
3000 IFY$(2)<>CHR$(55)ORY$(3)<>CHR$(55)T
HENGOTO5000
3010 N9=308:GOSUB4000:GOSUB6000:GOSUB900
0
3015 B1=B+200:GOSUB600:GOSUB580:GOTO4020
3018 '
3019 ' three dollar signs?
3020 IFY$(2)<>CHR$(36)ORY$(3)<>CHR$(36)T
HENGOTO5000
3030 N9=268:GOSUB4000:GOSUB6000:GOSUB900
0
3035 B1=B+100:GOSUB600:GOSUB580:GOTO4020
3038 '
3039 ' three diamonds?
3040 IFY$(2)<>Y$(1)THEN GOTO5000
3045 IFY$(3)<>Y$(1)ANDY$(3)<>CHR$(36)THE
NGOTO5000
3050 N9=228:GOSUB4000:GOSUB6000:GOSUB900
0
3055 B1=B+100:GOSUB600:GOSUB580:GOTO4020
3058 '
3059 ' three telephones?
3060 IFY$(2)<>Y$(1)THEN GOTO5000
3065 IFY$(3)<>Y$(1)ANDY$(3)<>CHR$(36)THE
NGOTO5000
3070 N9=188:GOSUB4000
3075 B1=B+18:GOTO4010
3078 '
3079 ' three gifts?
3080 IFY$(2)<>Y$(1)THEN GOTO5000
3085 IFY$(3)<>Y$(1)ANDY$(3)<>CHR$(36)THE
NGOTO5000
3090 N9=148:GOSUB4000:B1=B+14:GOTO4010
3098 '
3099 ' three hearts?
3100 IFY$(2)<>Y$(1)THEN GOTO5000
3105 IFY$(3)<>Y$(1)ANDY$(3)<>CHR$(36)THE

```

continued

phones or diamonds on Reels 1 and 2 gives you three of a kind. The dollar sign does not count as a wild card on Reels 1 and 2, however. This wild-card system duplicates the action of the real Twenty-One Bell machine and many other slots, which count a gold bar on the last reel as a wild card.

If you play until your *Now* balance is zero, SLOT.BA will tell you that the game is over. At this point, pressing *ENTER* will clear the screen and start a new game with \$20 for you to spend. If you press *ESC* instead of *ENTER* at the end of the game, the Model 100 will go to the main menu. Pressing *ESC* instead of *ENTER* also will call the main menu at any time during the game.

Play also will end if you are lucky enough to have a *Now* balance of \$500 or more. In this case, however, the display will tell you that *You broke the bank!*; to start over or to quit, press *ENTER* or *ESC*.

RANDOMIZATION

BASIC's random-number function gives you the same series of numbers every time you start it up. To make the game really random, SLOT.BA uses three techniques.

First, the program uses the *INKEY\$* function to skip through the random-number series while waiting for you to answer the sound-effects question (Lines 20-25). This skipping guarantees that the game gets off to a random start.

Second, when you pull the handle, the program spins the reels a number of times that is based partly on the time of day (Line 1120). This practice has the effect of skipping a randomly sized portion of the random-number series.

Third, the program uses the *INKEY\$* function to skip more random numbers while waiting for you to pull the handle (Lines 110-130). In about 7.5 seconds, the program skips 200 numbers in the series and blinks the *PLAY!* logo to remind you to keep spending your silver dollars.

THE FUN OF IT

There is no strategy to playing SLOT.BA, yet this 7,600-byte program fascinates people who would never really gamble - just as real slot machines have fascinated real gamblers since Charles Fey built the first slot in 1887.

More complicated slots than the Twenty-One Bell have more reels, fancier symbols and more complicated payouts. Some legal, competitive machines are designed to pay out very rarely but to pay only very large sums. Many modern machines accept up to eight coins per play. Such machines offer the opportunity to win or lose a fortune.

For the gamer who's interested in the game itself, however, SLOT.BA offers endless amusement - and you can't beat the price.

Ralph Sherman is a musician, gamer, and computer hobbyist. When he's not writing music or programs, he uses his Model 100 in his work as a reporter for the Bristol (CT) Press.

```

NGOTO5000
3110 N9=108:GOSUB4000:B1=B+10:GOTO4010
3118 '
3119 ' cent signs on Reel 1, or on Reels
      1 and 2?
3120 IFY$(2)<>Y$(1)THEN3130ELSEN9=68:GOS
UB4000:B1=B1+5:GOTO4010
3130 N9=28:GOSUB4000:B1=B+2:GOTO4010
3298 '
3299 ' sound effect for the smaller payo
      uts
3300 IFSO$="Y"THENSOUND4000,4:SOUND3175,
      4:SOUND2667,4:SOUND2000,4
3310 RETURN
3998 '
3999 ' byte-crunchers
4000 PRINT@N9,WB$:AR$:PRINT@N9+10,AL$:BW
      $:RETURN
4010 GOSUB6000:GOSUB3300:GOSUB550:GOSUB6
      00:GOSUB580
4020 PRINT@N9," ":PRINT@N9+10," ":GOTO10
      0
4998 '
4999 ' if combination is not a winner...
5000 PRINT@242,WB$;"SORRY";BW$:LINE(11,4
      7)-(41,55),1,B:IFSO$="Y"THENSOUND16000,3
      0
5010 GOSUB550:GOSUB580:GOTO100
5998 '
5999 ' display winning logo
6000 PRINT@242,WB$;"U WIN";BW$:LINE(11,4
      7)-(41,55),1,B:RETURN
7998 '
7999 ' if balance > $1000
8000 PRINT@12,WB$;" GAME OVER ";BW$
8010 IFSO$="Y"THENFORX=16000TO5000STEP-3
      00:SOUNDX,2:NEXTX
8020 PRINT@122," You ":PRINT@161," broke
      ":PRINT@201," the ":PRINT@241," bank!"
8025 LINE(36,11)-(39,14),0,B:LINE(36,11)
      -(40,15):LINE(39,11)-(35,15)
8030 PRESET(5,38):LINE(20,22)-(32,23),0,
      B
8040 LINE(9,21)-(43,58),1,B:LINE(7,19)-(
      45,60),1,B:LINE(6,18)-(46,61),1,B
8050 LINE(39,48)-(39,51):PSET(39,54)
8060 GOTO1040
8998 '
8999 ' jackpot sound effect
9000 IFSO$="N"THENRETURN
9010 S1=4353:S2=3265:S3=2591:S4=2176
9020 SOUNDS1,7:SOUNDS2,7:SOUNDS3,7:SOUND
      S4,4:GOSUB9200
9030 FORZ9=1TO3:SOUNDS4,2:GOSUB9210:NEXT
      Z9
9035 SOUNDS4,2:GOSUB9200
9040 SOUNDS3,4:GOSUB9200
9050 FORZ9=1TO3:SOUNDS3,2:GOSUB9210:NEXT
      Z9:SOUNDS3,2:GOSUB9200:GOSUB9210
9060 SOUNDS2,9:SOUNDS3,9:SOUNDS2,9:SOUND
      S1,30
9070 RETURN
9198 '
9199 ' musical pauses
9200 FORZT=1TO45:NEXTZT:RETURN
9210 FORZT=1TO13:NEXTZT:RETURN

```

End of listing.

Multiple Self-Prompting Function Key Banks for the Model 100

Wouldn't it be nice if the shift key could give you access to more function key definitions?

by Mike Wilson

If you've ever used an IBM-style computer, you know that they get a lot of mileage from the function keys by allowing them to be used with *modifiers* such as CTRL, SHIFT, and ALT. This yields several sets, or banks, of keys instead of just one.

Of course, this method has its drawbacks. Most programs that make heavy use of function keys come with a template or card to remind you what each combination of keys does. And heaven help you if you ever lose it.

Well, your Model 100 can do better than that. By using the techniques presented in this article you can give your computer up to 64 banks of function keys that will identify themselves whenever you press a modifier key, no need for templates or cards.

The program in Listing 1 demonstrates this power by activating seven banks of function keys, each with its own on-screen prompts. The program looks long, but most of the lines are short and whole sections are very similar. In fact, it is easier to create this program as a text file, making use of COPY and PASTE, and then load it into BASIC.

Type in the program and run it to see what it does. Then we'll examine

```

10 CLS
20 PRINT@40,"      ";:CALL30300
25 KEYSTOP
30 OUT185,255
40 X=INP(186)
50 OUT186,XAND254
60 A=INP(232)
70 PRINTCHR$(11);
80 IFA=255THEN GOSUB190:GOTO20
90 IFA=254THEN GOSUB300:GOTO20
100 IFA=253THEN GOSUB450:GOTO20
110 IFA=251THEN GOSUB600:GOTO20
120 IFA=247THEN GOSUB750:GOTO20
130 IFA=239THEN GOSUB900:GOTO20
140 IFA=223THEN GOSUB1050:GOTO20
150 PRINT@280,"      UNDEFINED KEY BANK - ACCESS:"A;:GOTO20
190 PRINT@280," F1  F2  F3  F4  F5  F6  F7  F8";:PRINT@0,:KEYON
200 ONKEYGOSUB220,230,240,250,260,270,280,290
205 CALL30300:OUT185,255:X=INP(186):OUT186,XAND254:A=INP(232):
IFA=255THEN190
210 RETURN
220 PRINT"F1":RETURN
230 PRINT"F2":RETURN
240 PRINT"F3":RETURN
250 PRINT"F4":RETURN
260 PRINT"F5":RETURN
270 PRINT"F6":RETURN
280 PRINT"F7":RETURN
290 PRINT"F8":RETURN
300 PRINT@280," S1  S2  S3  S4  S5  S6  S7  S8";:PRINT@0,:KEYON
310 ONKEYGOSUB330,340,350,360,370,380,390,400
315 CALL30300:OUT185,255:X=INP(186):OUT186,XAND254:A=INP(232):
IFA=254THEN300
320 RETURN
330 PRINT"S1":RETURN
340 PRINT"S2":RETURN
350 PRINT"S3":RETURN
360 PRINT"S4":RETURN
370 PRINT"S5":RETURN
380 PRINT"S6":RETURN
390 PRINT"S7":RETURN
400 PRINT"S8":RETURN
450 PRINT@280," C1  C2  C3  C4  C5  C6  C7  C8";:PRINT@0,:KEYON
460 ONKEYGOSUB480,490,500,510,520,530,540,550
465 CALL30300:OUT185,255:X=INP(186):OUT186,XAND254:A=INP(232):
IFA=253THEN450
470 RETURN
480 PRINT"C1":RETURN
490 PRINT"C2":RETURN
500 PRINT"C3":RETURN

```

continued

Listing 1. Here's a program that adds MACRO key ability to your Tandy 100.


```

510 PRINT"C4":RETURN
520 PRINT"C5":RETURN
530 PRINT"C6":RETURN
540 PRINT"C7":RETURN
550 PRINT"C8":RETURN
600 PRINT@280," G1 G2 G3 G4 G5 G6 G7 G8";:PRINT@0,:KEYON
610 ONKEYGOSUB630,640,650,660,670,680,690,700
615 CALL30300:OUT185,255:X=INP(186):OUT186,XAND254:A=INP(232):
IFA=251THEN600
620 RETURN
630 PRINT"G1":RETURN
640 PRINT"G2":RETURN
650 PRINT"G3":RETURN
660 PRINT"G4":RETURN
670 PRINT"G5":RETURN
680 PRINT"G6":RETURN
690 PRINT"G7":RETURN
700 PRINT"G8":RETURN
750 PRINT@280," D1 D2 D3 D4 D5 D6 D7 D8";:PRINT@0,:KEYON
760 ONKEYGOSUB780,790,800,810,820,830,840,850
765 CALL30300:OUT185,255:X=INP(186):OUT186,XAND254:A=INP(232):
IFA=247THEN750
770 RETURN
780 PRINT"D1":RETURN
790 PRINT"D2":RETURN
800 PRINT"D3":RETURN
810 PRINT"D4":RETURN
820 PRINT"D5":RETURN
830 PRINT"D6":RETURN
840 PRINT"D7":RETURN
850 PRINT"D8":RETURN
900 PRINT@280," N1 N2 N3 N4 N5 N6 N7 N8";:PRINT@0,:KEYON
910 ONKEYGOSUB930,940,950,960,970,980,990,1000
915 CALL30300:OUT185,255:X=INP(186):OUT186,XAND254:A=INP(232):
IFA=239THEN900
920 RETURN
930 PRINT"N1":RETURN
940 PRINT"N2":RETURN
950 PRINT"N3":RETURN
960 PRINT"N4":RETURN
970 PRINT"N5":RETURN
980 PRINT"N6":RETURN
990 PRINT"N7":RETURN
1000 PRINT"N8":RETURN
1050 PRINT@280," L1 L2 L3 L4 L5 L6 L7 L8";:PRINT@0,:KEYON
1060 ONKEYGOSUB 1080,1090,1100,1110,1120,1130,1140,1150
1065 CALL30300:OUT185,255:X=INP(186):OUT186,XAND254:A=INP(232):
IFA=223THEN1050
1070 RETURN
1080 PRINT"L1":RETURN
1090 PRINT"L2":RETURN
1100 PRINT"L3":RETURN
1110 PRINT"L4":RETURN
1120 PRINT"L5":RETURN
1130 PRINT"L6":RETURN
1140 PRINT"L7":RETURN
1150 PRINT"L8":RETURN

```

End of listing.

the important lines of code so you can see how it works.

When you run this program it prints *F1, F2, F3...F8* on your screen above the function key location markers. (If you get *L1, L2*, etc. you've got your *CAPS LOCK* key down and are getting ahead of the rest of us; release it.)

If you press one of the function keys the program will print its number at the top of your screen (e.g. *F1, F2*, etc.). That's really about all the program does. With one rather big exception.

Press the *SHIFT* key. Notice that

the prompts now read *S1, S2, S3...S8*. If you press a function key while holding down *SHIFT* the program will print "*S#*" instead of "*F#*". This is the second bank of function keys. When you release *SHIFT* the display goes back to the normal *F1-F8* bank.

You can access other banks of keys by pressing *CTRL, CAPS LOCK, GRPH, CODE*, or *NUM*. As long as the key is down, the display will show a new set of prompts and each function key will jump to its routine for that bank. Use *CTRL-C* or *BREAK* to stop the program, if you need to interrupt it.

There are seven banks of keys (including the unmodified *F1-F8*) defined in this program, but there are many others available. After we look at how the program works, you'll see how you can program these other keys as well.

The program consists of three major sections, two of which are repeated for each bank of keys. They are: the Main Loop, which determines which modifier key (if any) is pressed; a set of prompts and definitions for each bank of keys; and the function key routines themselves. We'll look at each of these sections.

MAIN LOOP

The Main Loop for this program runs from Line 20 to Line 150. It reads and writes to a couple of ports in the Model 100 that control keyboard

There are seven banks of keys.

scanning and then jumps to the selected key bank. Because this is the heart of the program and you need to understand it to make use of this technique, we'll cover it detail.

First, a word of warning. Make sure that you understand what is happening before you start experimenting. Failure to follow the rules may make your Model 100 ignore keyboard input (including *BREAK*) or even turn itself off completely.

Line 20 begins the Main Loop. It first erases any display that may have been printed by a pressing a function key and then turns off the background task.

The background task is a set of routines built into the computer that are executed about 256 times a second even when you are running a program. It controls keyboard scanning, blinking the cursor, and reading the clock. In effect, the computer

is doing two things at once; running your program (the foreground task), and executing the background task.

CALL 30300 turns off the background task so that we can read the keyboard directly without interference. The background task is automatically turned on again every time you print to the screen or when BASIC finishes running a program, but while it is off, the keyboard is not being read unless we do it ourselves.

Line 25 stops the function key interrupt so that the prompts won't show up at the wrong place on the screen.

Line 30 starts our own keyboard routine by using the *OUT* command of BASIC to access port 185. This port is used by the computer to scan most of the keyboard and by sending the value 255 we effectively disable it.

Lines 40, 50, and 60 take care of the rest of the keyboard. Port 186 is used to scan only the *SHIFT*, *CTRL*, *CAPS LOCK*, *GRPH*, *CODE*, *NUM*, and *PAUSE/BREAK* keys. Since this port also controls other things, including power to the computer, you have to be very careful when you access it.

The correct way is to first read the port (Line 40) and then program the bits you are interested in with *AND* or *OR* (Line 50). By sending the value initially read from the port *AND*ed with 254 we change only the bit that controls keyboard scanning without disturbing the other bits in the port which control other functions.

At this point in the program only the keys listed above will return a code from the keyboard scanner. This code appears at port 232 and is read in Line 60. The value that is returned tells us which key has been pressed. Table 1 lists the keys and the codes they will return.

Line 70 homes the cursor and turns on the background task.

The rest of the Main Loop is straight forward. We check the value returned from port 232 to see which key or keys (if any) have been pressed and jump to the section of code that activates that key bank. If the value is

KEY	CODE
NONE	255
SHIFT	254
CTRL	253
GRPH	251
CODE	247
NUM	239
CAPS LOCK	223

Table 1. Codes for the special key control keys.

not one of those tested in the *IF-THEN* statements, the program prints an "UNDEFINED KEY BANK" message along with the value returned from the port. More on this later.

FUNCTION KEY PROMPTS AND DEFINITIONS

The second major section of the program is the function key Prompt

CALL 30300 turns off the background task.

and Definition routine. This section is repeated for each defined bank of function keys and the structure of each is the same. Only the screen prompts and the some of the numbers are different. Examples of this section are Lines 300-320, 450-470, and others.

Each section begins by printing the prompts for the selected key bank. It then sends the cursor to the top of the screen and turns the key interrupts back on.

The next line is a standard function key interrupt definition that primes the keys with the addresses of their routines.

The next line performs the same job as the Main Loop by turning off the background task and reading the keyboard. This line makes sure that the correct prompts and interrupts

are available as long as you keep the modifier key depressed.

These sections of the program end with a *RETURN* that sends you back to the Main Loop when you release the modifier key.

FUNCTION KEY ROUTINES

This section of the program, which is repeated many times, is just the action that each key performs when pressed. Examples are lines 220-290, 330-400, and others. In this program, each key simply prints its identifier and returns.

You could turn this demonstration program into something more useful by changing the appropriate prompt line and inserting your own function key routines.

Actually, the program does have one useful purpose if you intend to use this technique. Pressing two or more modifier keys while the program is running, gives the "UNDEFINED KEY BANK" message. For example, try pressing both the *CAPS LOCK* and the *NUM* keys. The program should reply: "UNDEFINED KEY BANK - ACCESS: 207". The 207 is the code that is being returned from port 232. By putting another *IF-THEN* statement in the Main Loop and checking for the value 207, you can gain access to yet another bank of eight function keys that will only show up when both the *CAPS LOCK* and *NUM* keys are depressed.

By trying different combinations of two, three, or more keys at once you can determine what value you need to check for to jump to the bank that is called up by that particular key combination.

There are 64 sets of function keys available using this method, giving you access to 512 self-prompting function keys.

So, write your own applications using this method, and practice your superior smile for the next time you see someone pulling out a keyboard template for one of those bulky desktop computers.

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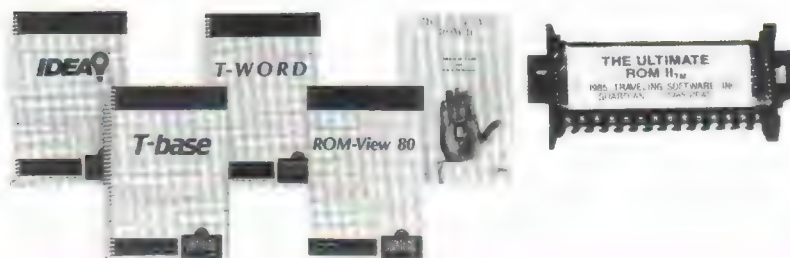
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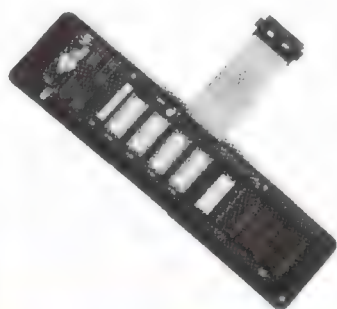
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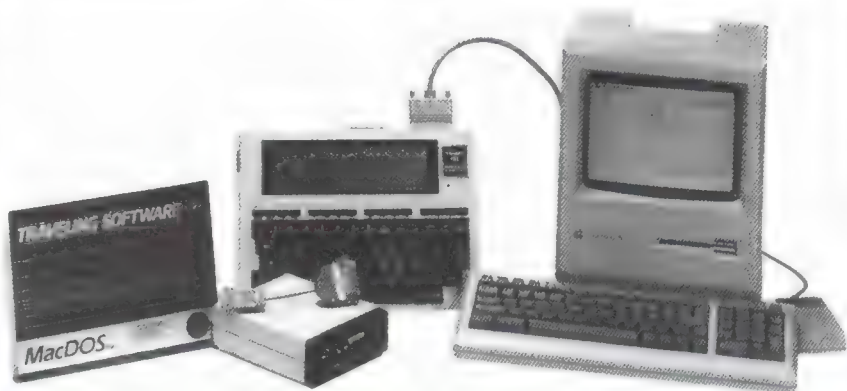
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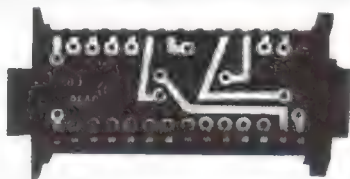
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Product Name	Tandy 100	Tandy 102	Tandy 200	NEC	Macintosh	IBMs & compatibles
ULTIMATE ROM II	RS1-UR2	RS1-UR2	RS3-UR2	NE1-UR2		
SARDINE Disk	RS1-SD1	RS1-SD1	RS3-SD1	NE1-SD1		
SARDINE ROM Chip	RS1-SD2	RS1-SD2	RS3-SD2	NE1-SD2		
SARDINE 4 ROM Set for Booster Pak	RS1-SD3	RS1-SD3				
MAC-DOS II	API-MD1	API-MD1	API-MD1	API-MD1	API-MD1	
LAP-DOS II	PC1-LD1	PC1-LD1	PC1-LD1	PC1-LPD1		PC1-LD1
POWERCELL	HW1-PP1	HW1-PP1	HW1-PP1	HW1-PP1		
8-ROM EXPANSION PAK w/SARDINE PLUS w/TS-DOS	RS1-SD4 RS1-TS3	RS1-SD6 RS1-TS4	RS3-SD3 RS3-TS3	NE1-SD3 NE1-TS3		
TS-DOS Disk	RS1-TS1	RS1-TS1	RS3-TS1	NE1-TS1		
TS-DOS ROM Chip	RS1-TS2	RS1-TS2	RS3-TS2	NE1-TS2		
ROM2/CLEASAU ASSEMBLER	RS1-CL1	RS1-CL1	RS3-CL1	NE1-CL1		
BOOSTER PAK	HW1-BP1	HW1-BP2				
Options:						
32K CMOS RAM (\$20)	HW1-BP3	HW1-BP3				
6 Slot RAM Expansion Board (\$69)	HW1-BP4	HW1-BP4				
256K RAM Expansion Modules (\$159)	HW1-BP5	HW1-BP5				
Internal Nicad Battery Pak (\$69)	HW1-BP6	HW1-BP6				
IBM PC Booster Link w/cable (\$69.95)*	PC1-BL1	PC1-BL1				PC1-BL1
Mac Booster Link w/cable (\$69.95)*	API-BL1	API-BL1			API-BL1	
Sardine Plus 4 Chip Set (\$194.95)	RS1-SD3	RS1-SD3				
BOOSTER LINK (Mac)	API-BL1	API-BL1	API-BL1	API-BL1	API-BL1	
BOOSTER LINK (IBM)	PC1-BL1	PC1-BL1	PC1-BL1	PC1-BL1	API-BL1	PC1-BL1

*BOOSTER PAK owners and purchasers save \$30.00. Only \$69.95. Limited time offer.

Traveling Software



FAIL-SAFE ALARM

Cheap Theft Insurance For Your Portable

by W. R. Henry

When my briefcase with a Portable 100, data cassettes and recorder were stolen from an airport, I decided to prevent this from ever happening again. I designed and installed a powerful theft alarm in my briefcase. Not only is the alarm loud enough to deter any would-be thief, but the cost was minimal. The alarm consists of items bought off-the-shelf which were easily modifiable. The total cost for assembling this device is about seventeen dollars. This is a small sum to protect an investment of one thousand dollars or more. Had I had it when the theft occurred, I would not have had to replace a Model 100, a cassette recorder, three ROM chips plus my attache case.

The theft alarm is placed in my briefcase or attache case along with my computer. I can also use this device as an alarm system in a motel or hotel room. Once the alarm is activated, only the owner knows how to turn it off. I call it my fail safe alarm.

When traveling I set the alarm, which is secured in my briefcase by hook and loop fasteners strips. The alarm remains silent as long as my briefcase is laying flat. Should anyone pick up the case, the alarm is activated and sounds off. Basically,

the alarm is a battery operated unit sold by Radio Shack called the Powerhorn Alarm.

The adaptation of the Powerhorn Alarm unit requires no modification of the unit itself. It is simply a mercury switch wired to a phone plug which plugs into an existing phone jack on the Powerhorn Alarm. Thus as long as you set the briefcase or attache case flat, the alarm is inactive. My attache case has a combination lock on it. If someone picks up the

**Should anyone
pick up the case,
the alarm activates
and sounds off.**

case, it is impossible for them to open the case and turn off the alarm. Also, the alarm unit itself can be set with a combination code.

SIMPLE INSTALLATION

The accompanying photos help to explain the installation of the alarm in an attache case. It occupies little space in the briefcase and is powered by an inexpensive nine-volt battery



Photo 1. Powerhorn Alarm unit with Sensor plug installed in attache case.

obtainable almost anywhere. Battery drain is nil until the alarm sounds off. When it does go off, the volume is very loud. My battery has been in use now for two years and is still strong whenever I test the alarm.

A schematic is included for the simple plug-in alarm adapter. You don't have to be an expert with a



Photo 2. The completed sensor plug in unit and the door-switch unit it replaces.



Photo 3. Back of the Powerhorn unit with the hook-and-loop fastener strip glued in place.

soldering iron to make the four simple solder joints required to add the mercury switch. This switch is the key component.

A CHEAP SECURITY INVESTMENT

As I mentioned when I travel alone on business trips this unit serves not only to protect my briefcase and its contents, but enables me to sleep peacefully when in a hotel or motel room. The alarm can be set for its original purpose, which is to sound an alarm should someone open the door to my room. Because hook and loop fasteners strips are used to fasten the Powerhorn Alarm in place in my briefcase, I can remove the unit easily should I wish to use it as a door alarm.

I've found the alarm well worth the cost. It is certainly much cheaper than a commercial insurance policy for protecting my computer and the client data I input during trips.

When my case was stolen, I had several cassettes of client data in it. It was embarrassing to have to go back and duplicate this data. Added to the replacement cost for my equipment I

was doubly insured. This simple, inexpensive hardware solution has eliminated the chance of a second expensive and embarrassing theft.

I use the unit constantly on trips, secure in the knowledge that it works. It is simple, noisy, cheap and effective.

THE PLUG-IN ADAPTER

Unscrew the phone plug's black barrel. Strip 1/8 inch of insulation from each end of two 1 inch lengths of solid hook-up wire. Tie the bare ends of each wire. Slip the plastic barrel of the phone plug over the two wires. Solder the two wires to the tip and ring contacts on the plug respectively. Solder the other two ends to the mercury switch leads. Screw the plastic barrel back onto the phone plug. Plug the adapter into the Powerhorn unit.

Install the battery in Powerhorn, set the combination on the alarm, and test the unit.

Glue hook and loop fasteners strips to both the

powerhorn and to the inside of your attache case.

TEST THE UNIT

Now if it doesn't work, you have goofed some place. Re-read the instructions and do a continuity test on the adapter circuit. Resolder if necessary.

It takes about one hour to put this system together, even if you are all thumbs like myself.

W.R. Henry is a self-employed computer consultant and an applications programmer of the Tandy 100 since its inception. His main use of the 100 is in on-site data gathering and data analysis for clients. Additional use is for word processing and spreadsheet output using PCSG's Super Rom chip.

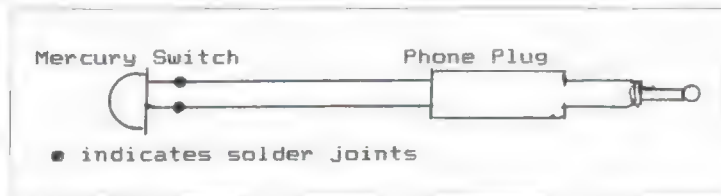


Figure 1. Diagram of the alarm sensor plug, showing the electrical connections.

Description	R/S Cat.#	Cost
1. Safehouse		
Personal Powerhorn*	49-610	12.95
2. 1/8" Phone Plug (2-pkg)	274-286	1.39
3. Glass Mercury Switch	275-027	1.19
(or metal tilt switch if available)		
4. Solder	64-001	.89
5. Hook and loop fasteners Strips		2.00
6. 9 Volt Battery	23-553	1.99

* If this model is not in stock, others are available.

** Hook and loop fasteners strips obtainable at most variety or hardware stores as a kit with adhesive

Figure 2. The parts list for the alarm system.

T-Backup- Model 100 Changeover

*Save your Model 100/102, 200, Olivetti M-10 or
NEC PC-8201 from losing its memory, and your files,
with this easy-to-use tape backup program.*

by Ralph Tenny

The Radio Shack Model 100 is so versatile that it gets involved in many different projects. However, unlike computers which can boot from application-specific disks, a change in Model 100 function requires a memory purge. A cold start does the purge, but what about the saving of the current data?

T-backup is a tape save utility which saves the entire Model 100 working RAM contents in one pass, and provides easy verification. In less than 15 minutes you can change from one task to another, and provide excellent security for the data and programs of both applications. Or, you can keep daily backup copies of critical applications data at a cost of about nine minutes per save. The actual save takes about four and one-half minutes for a 32K machine (or for each bank of a multi-bank machine). You are then reminded to verify the save (re-wind the tape and read it back for comparison). If the save is not successful, you can make another try without disturbing the data currently in the machine.

T-backup comes in an attractive package with a comprehensive and clearly-written manual. The tape loaded on the first try and the program worked exactly as advertised. It occupies 2,300 bytes of memory

and uses 600 bytes as working scratch pad. Each memory bank of multi-bank machines must have a copy of *T-backup* installed if you plan to save the bank.

Once loaded, *T-backup* is operated from menu displays and is very easily learned. Menu 1 offers function key selection of *backup*, *verify*, and *restore* functions. The program exits with the *F8* key.

Pressing *F1* takes you into *backup* mode. A new screen prompts you for a six-character filename and a 28-character comment. After you type the comment, you are prompted *Begin (y/n)?*, giving you a last chance to set the tape for record. Pressing *y* starts the process without using *ENTER*. After the save is complete, you are reminded to *verify* the tape.

The *verify* is also easy—rewind the tape and press *F2* to start the operation. If the *verify* is correct, the job is done. For a data changeover, you can then do a cold start and *restore* data from another task.

The *restore* operation is similar to *backup* and *verify*, except that it starts



from the *F3* key. After the tape header is read, the tape stops and the display shows the tape name, comment time and date of saving. This extra information provides a double-check on the identity of the data being loaded. No attempt will be made to restore data saved from a machine equipped with a different amount of RAM.

Manufacturers Specifications
Traveling Software, Inc.
11050 Fifth Avenue Northeast
Seattle WA 98125
206-367-8090

T-backup --\$19.95
An important utility for anyone using a Model 100 or 200, Olivetti M10 or NEC PC-8201.

Protocol Testing With Tandy

Model 100 as an Analyzer

by Philip Ouellette

The Tandy Model 100/102 computer is the most versatile piece of test equipment a computer technician or engineer can carry. A pretty strong statement, but one I think can be easily supported.

First of all Tandy was smart enough to include a plethora of interfaces, Bar Code Wand, Centronics Printer, RS-232, Modem. Virtually all of the common methods of computer communications are included. In addition there is sufficient software support to make them useful for analyzing problems. Malfunctions are much easier to correct if you know which machine is at fault.

The RS-232 so called standard is the most common way to get information from one machine to another. The physical problems of correct wiring, hardware handshaking, data rates, etc., have been covered in print many times. But speak of protocol and most people think of the Goldy Hawn movie of the same name.

Protocol is like grammar in speech, a way of organizing data into an understandable conversation. There can be nothing more confusing than talking to somebody who has a different idea about what certain words mean. The same thing can happen with computers, and drive both them and you crazy. When a

design engineer has this sort of problem, he pulls out a \$5,000 serial data analyzer and finds out what's going wrong. Unfortunately, the rest of us have to make do with affordable tools.

Recently, I had that kind of problem between a computerized coin counter and a Las Vegas casino's

A \$500 Model-100 did as good a job as the \$5,000 unit would have

mainframe. The problem was with certain non-printable ASCII codes. My machine was expecting an acknowledgement message back from the mainframe and it wasn't getting it. I had to figure out if the fault was in my machine or the mainframe.

First I used *TELCOM* to download the transmission from my machine into a data file on the M-100. Then I examined the file using *TEXT*. The characters I was interested in were displayed as control codes. I looked up the control codes in the appendi-

ces of the users manual. It turned out my machine wasn't sending an *STX* code at the beginning of its transmission like it was supposed to. A simple software fix got me out of what could have been a sticky situation. Imagine a \$500 Model-100 did as good a job as the \$5,000 unit would have.

The benefit to me was that I could identify the problem and verify that it was corrected without involving another manufacturer's rep. Without my Model 100 it would not have been as easy to determine whose equipment was at fault.

This example shows the value of a portable terminal to service personnel. You can also test serial and parallel printers, read bar codes to see if they are machine legible, test modems. The uses are only limited by your imagination.

So you see your portable can be more than just an address or note book. As for my Model-100, it goes along on every job. □



Make your Model 100, 102, or 200 practically perfect

PCSG has long been the champion of the Model 100 and 200 laptop portable computers. No longer toys, these machines can be made to rival the performance of many desktop models.

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Write ROM

This is full word processing capability like on a desktop. Not only format documents with left and right hand

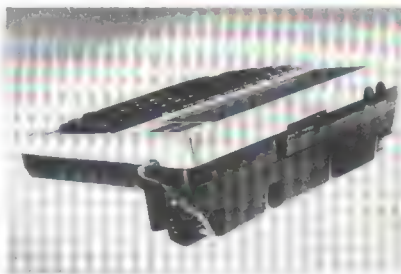
margins, page numbers, headers, footers but phenomenally more. Write ROM gives you memory writing performance: 44 features and functions that really bring text processing power to the Model 100, 102. \$99.95, plus shipping.

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Features like LOTUS 123. But not just a spreadsheet, a program generator as well. Features like Cut and Paste, variable column widths and lightning fast calculation speed. Lucid changes your computer into capacity you never thought possible in the Model 100, 102, \$99.95, plus shipping

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Now your Model 100, 102, 200 plus any desk top computer is an instant disk system. With a function key transfer any files or BASIC or machine code programs to and from your portable and the other computer. The IBM version works over the phone \$149.95, plus shipping. Cable \$40.00



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Perform those strategic "what if"

business problems. Allows detailed financial analyses like Breakeven, IRR, NPV, return on investment, interests costs, PV and others at the touch of a function key. Prints detailed reports. So easy! Also it performs simple everyday calculator functions. Check it out! \$99.95, plus shipping. Model 100, 102

HARDWARE

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The Budget Banks

How to get those two extra 24K memory Banks to fit in your Budget

by Paul Globman and James Yi

With all the new information available about bank switching, peeking/poking, and chaining across banks, it seems inconceivable that anyone would settle for a one bank Tandy 200. Unfortunately the price of the additional 24K RAM modules are quite high.

Imagine spending \$400 (Tandy prices) for two extra 24K RAM banks! I can't afford it, but I can easily afford \$40 (or less) for two extra RAM banks. So I picked up a pair of 32K CMOS RAM chips, a soldering iron, a diagram of the Tandy 200 RAM expansion port (from the tech manual) and diagram of the RAM chip (from a memory products data book). As far as construction projects go, this is going to be easy. There are no internal changes to the Tandy 200, and the only soldering involved, is merely connecting three short pieces of wire to the pins of the RAM chip.

On close examination of the port and the chip, I found that there were three pins that did not match. I just moved them to their proper socket hole with piece of wire and the soldering iron. I installed two banks this way. The pins that are re-matched are 1, 27, and 22. Pins 1 and 27 are interchanged, and pin 22 ties to pin 20.

Here's the procedure...

1. Because the chips are CMOS, take proper caution so that they won't be zapped by static electricity. Moistening your fingers and hands may lessen the chance of static build up. Don't try this on a rug.
2. With a long nose pliers, bend up pins 1, 27, and 22 of the chips so that they stick straight out horizontally.
3. Using a grounded, low power soldering iron, attach pieces of wire about 1 inch in length, to pins 1 and 27.
4. Attach a piece of wire about 1/2 inch to pin 22.
5. Flip the Tandy 200 over, turn the MEM switch off, and open the memory expansion lid.
6. You'll see that if you try to plug the chip in the socket, the socket is too wide, that is if you try to insert it in the outer contacts. There are inner contacts (insert the pins of the chip between the

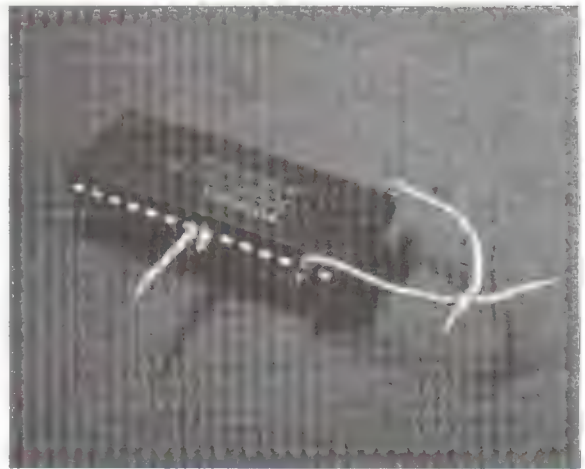


Photo 1. The Toshiba chip needed to expand the memory of your Tandy 200 computer.



Photo 2. The chip with soldered wires inserted into socket.

Directional ↔ Aid

by Warren L. Wilson

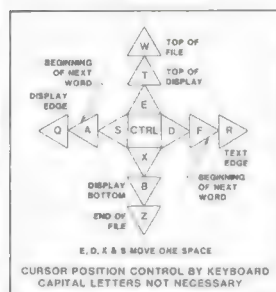


Figure 1. A template for cursor control.

Here is an aid that I have found helpful for some time. I have a reduced copy on the top-right hand corner of my Model 100, but not covering the low battery lamp. I recently had this aid cleaned up, camera ready, and thought that I might share it with others. My thanks to Diane Finnegan for the clean-up.

Data Acquisition System For the Model 100/102 and Model 4

Provides engineers, technicians, educators, students and experimenters with a flexible solution to data acquisition and interface needs using the Model 102 and Model 4 computers:

M102-DACQ-1 \$185.
8 digital input lines; 8 digital output lines; 8 channel, 8 bit A/D (ADC0809) 8 bit D/A (DAC0831); 3 channel, 16 bit prog timer (82C53); auto on/off; interfaces to system bus; 3 sq. in. wire wrap; user manual, schematics, programming instructions/examples. Board (4.2" x 7.6") cabling and AC adapter. No case.

M102-DACQ-TERM \$100.
Terminal board for DACQ card and customer hardware; all DACQ signals available; screw terminals and diode clamps for all analog inputs; 12 sq. in. wire wrap; stand-offs to mount above M102-DACQ. Cabling provided.

HI CAPACITY BATTERY PACK \$95.
Sealed lead acid; outputs for both M102 and DACQ; charger, case.

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M102-DACQ SYS1 \$295.
Both DACQ-1 and DACQ-TERM cards mounted in case with terminal card exposed for easy access.

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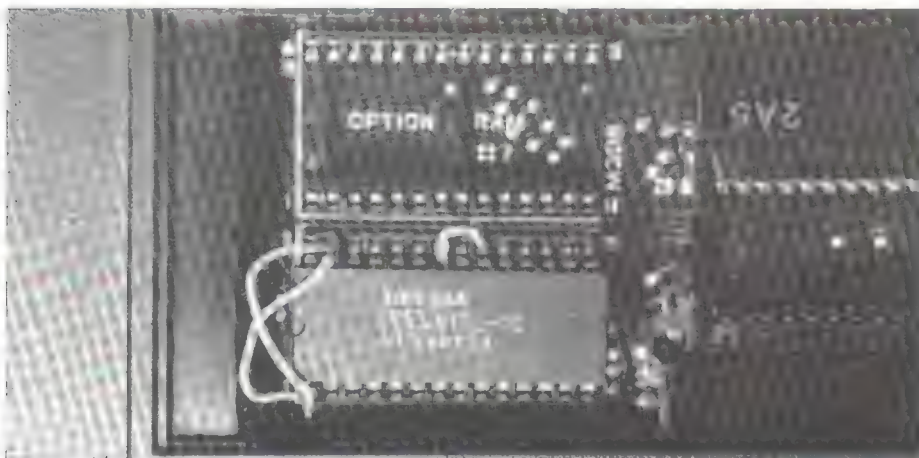


Photo 3. The chip installed in the Expansion RAM socket.

metal contact and the plastic of the socket), where the chip will fit. Before plugging in the chip, first insert the wire lead from pin 1 of chip into the outer contact of pin 27 of the socket. Then insert the wire

lead from pin 27 of chip into pin 1 of the socket, and the wire lead from pin 22 of chip into pin 20 of the socket.

7. Carefully insert the chip into the socket.

8. After verifying that the wires do not touch each other or other pins, put the lid back on and turn on the MEM switch.

This project may not be for everyone, some experience with a soldering iron and handling CMOS is required.

The chip I used was a TC55257PL-10 but the project was developed using a HM43256LP-15, which can be obtained from JDR Microdevices, 110 Knowles Drive, Los Gatos, CA 95030. Their phone number is 1-800-538-5000, and the chip can be mail ordered for \$12.95 each.

Be sure that the chip you use is LP (low power). The LP might be part of the chip number.

LECTRO: A Construction Utility

If you like to experiment with electronics, here's a useful program to alleviate some of the math problems you may encounter.

by W. R. Henry

LECTRO is for those who like to construct electronic devices, but dislike keeping all the math in their head. As a bonus, directions are included for the construction of a simple two-wire cable which turns your computer into a continuity tester. It is cheap and it stores in your pocket.

LECTRO GIVES USER OPTIONS

The program *LECTRO.BA* handles some of the most often used calculations in electronic construction. Using it as a *shell* program you can substitute your own menu options and sub-routines to handle whatever math calculations you wish. Simply edit those portions dealing with the menu options and their related subroutines to those that suit you. To keep the program as compact as possible remarks are not included (I've found it easy to follow program execution by simply editing each program line with a *STOP* command at the end of each program line.

SINGLE KEY ENTRY

Notice the subroutine at line 40500. This is a single-key entry which returns the key you hit as your menu option choice without the necessity of hitting the *ENTER* key. The same subroutine exits you from the program if you hit the */* key. It also is invoked after the prompt *Any key to continue*. Also, wherever a time delay is needed for the user to view the screen, this is handled in the subroutine in line 30000. This is a simple time delay loop.

BUILDING & USING THE TESTER CABLE

The tester cable consists of a length of speaker cable about 16 inches long. At one end are two flea-clips. At the other are either two insulated alligator clips or a test probe and an alligator clip (your choice). It will take longer to key in the *LECTRO.BA* program than to make the four simple

```
0 'OHMCAL
1 CLS: CLEAR 500
90 PRINT @121, "* LECTRON: A hardware hacker
  er utility *"
95 PRINT@172, "By W.R. Henry": GOSUB30000:
  CLS
100 PRINT"      <1> Ohms from Color Bands
      <2> Circuit check w/Compu
ter      <3> Find circuit Paramete
rs      <4> Find 555 IC delays";
110 PRINT@241, "Choose by Number, or Hit [
  key to end...";
130 GOSUB40500: A$= INSTR(CHR$(91) + "123456
  ", A$): IFA$=0 THEN 40500 ELSE ON A$ GOTO 190, 200
  , 600, 700, 800, 900
190 CLS: PRINT@163, "Thanks for using LECT
  RON, BYE NOW": GOSUB30000: CLS: END
200 CLS: PRINT "CONVERTING TO OHMS FROM CO
  LOR BANDS": GOSUB30000: CLS
201 LINEINPUT "1ST BAND "; B$
205 LINEINPUT "2ND BAND "; C$
210 LINEINPUT "3RD BAND "; D$
215 IFB$="BLK" THEN A=0
220 IFB$="BRN" THEN A=1
225 IFB$="RED" THEN A=2
230 IFB$="ORG" THEN A=3
235 IFB$="YEL" THEN A=4
240 IFB$="GRN" THEN A=5
245 IFB$="BLU" THEN A=6
250 IFB$="VIO" THEN A=7
255 IFB$="GRY" THEN A=8
260 IFB$="WHI" THEN A=9
270 M$=STR$(A)
275 IFC$="BLK" THEN B=0
280 IFC$="BRN" THEN B=1
285 IFC$="RED" THEN B=2
290 IFC$="ORG" THEN B=3
295 IFC$="YEL" THEN B=4
300 IFC$="GRN" THEN B=5
305 IFC$="BLU" THEN B=6
310 IFC$="VIO" THEN B=7
315 IFC$="GRY" THEN B=8
320 IFC$="WHI" THEN B=9
325 M$=M$+STR$(B)
330 IFD$="BLK" THEN C=.0
335 IFD$="BRN" THEN C=10
340 IFD$="RED" THEN C=100
345 IFD$="ORG" THEN C=1000
350 IFD$="YEL" THEN C=10000
```

continued

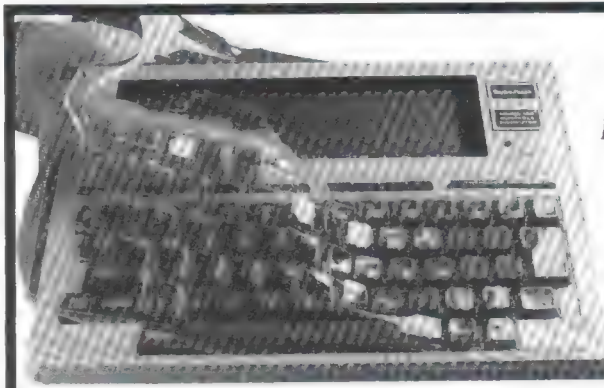
Listing 1. A program to help hardware hackers hack.

soldering joints necessary for the cable. Even if, like myself, you are all thumbs on soldering.

As you may know, the phone port on the back of the portable has other uses (see page 207 of your Model 100 operation manual for a diagram of this port). Continuity between pin-ports 2 and 8 can be tested with the simple subroutine in line 680 of *LECTRO.BA*. You can safely test this by choosing option number 2 from the menu, and inserting the ends of a paper clip bent into a U shape into holes 2 and 8 of the Phone port. This will not harm your computer (I adapted the software routine from *RING DETECT*, by Carl Oppedahl, in a previous issue of *Portable 100*.

DO A LITTLE RESEARCH

If you sometimes get stumped on some electronic formula as I do, you will usually find ample material in the way of formulas at your local library. Have fun on your next construction project, and let *LECTRO.BA* and the continuity checker help make it easier.



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Circle 65 on Reader Service card.

```

355 IFD$="GRN"THENC=100000
360 IFD$="BLU"THENC=1000000
365 IFD$="SIL"THENC=MOD100
370 IFD$="GLD"THEN C=MOD10
375 K$=STR$(C)
520 PRINT"RESISTOR VALUE IS "; VAL(M$)*V
AL(K$); " OHMS
530 GOSUB30000:GOTO1
600 CLS:PRINT"FUNCTION:Circuit Continuit
y Checker":GOSUB30000:CLS
605 PRINT@81,"WARNING! Before using your
computer as a Continuity Checker be su
re circuit under Test has NO Voltage
present else Damage to Computer may
result."
610 PRINT:PRINT"Hit any key..."
620 GOSUB40500:IFA$=""THEN630
630 CLS:PRINT"UNDER TEST,COMPUTER BEEPS
IF CONTINUITY IS O.K. OR LCD SAYS (NO CK
T CONTINUITY)"
650 PRINT"Plug flea clips into PHONE por
t holes #2 & #8 & micro clips into cir
cuit being tested"
660 PRINT"To test,hit ENTER key.To end S
HIFT BREAK";
670 GOSUB40500:GOTO680
680 IF (INP(208)AND32)=0THENCLS:BEEP ELSE
PRINT"(NO CKT. CONTINUITY)"
685 GOTO680
700 CLS:PRINTSPACES(5); "<1> Find Voltage
";SPACES(24); "<2> Find Resistance";SPACE

```

continued

```

$(21); "<3> Find Amperage";
705 PRINT@241,"Choose by number";
710 GOSUB 40500:A$=INSTR(CHR$(91)+"1234"
,A$):IFA$=0THEN710ELSEONA$GOTO190,720,75
0,780
720 CLS:PRINT"FUNCTION:FIND CIRCUIT VOLT
AGE":INPUT"CIRCUIT AMPERAGE ";A
730 INPUT"CIRCUIT RESISTANCE ";R
735 CLS:PRINT"CIRCUIT VOLTAGE IS ";A*R;"
VOLTS":GOSUB30000:GOTO1
750 CLS:PRINT"FUNCTION:FIND CIRCUIT RESI
STANCE":INPUT"CIRCUIT VOLTAGE ";V
755 INPUT"CIRCUIT AMPERAGE ";A
760 PRINT"CIRCUIT RESISTANCE IS ";V/A;"O
HMS":GOSUB30000:GOTO1
780 CLS:PRINT"FUNCTION:FIND AMPERAGE":IN
PUT"CIRCUIT VOLTAGE ";V
785 INPUT"CIRCUIT RESISTANCE ";R
786 PRINT"CIRCUIT AMPERAGE IS ";V/R:GOSU
B30000:GOTO1
800 CLS:PRINT"FUNCTION:TIME DELAYS FOR 5
55 CHIP"
810 INPUT"CAPACITANCE USED ";C
820 INPUT"RESISTANCE USED ";R
830 TD=C*R:PRINT"TIME DELAY IS ";TD;" SE
CONDS":GOSUB30000:GOTO1
10000 IF (INP(208)AND32)>0 THEN PRINT"N
O CONTINUITY":RETURN
30000 FORT=1TO1500:NEXTT:RETURN
40500 A$=INKEY$:IFA$=""THEN40500ELSERETU
RN

```

End of listing.

REVEILLE!

You Got to Get Up, You Got to Get Up,...
by Richard D. White

Remember when you were in Scouts or the military and were awaked at dawn by Reveille? This simple BASIC program takes advantage of the Model 100's great versatility to play Reveille for you when it's time to get up. It turns your laptop portable into a musical travel alarm that's perfect for business trips or bivouacs.

It won't jab you in the ribs with a swagger stick or kick your bunk, but it will tell you to get up with an insult, just like your old drill instructor would have done. You set the alarm, in 24-hour *military* format, of course, before you go to bed. When it's time to get up, the computer will sound Reveille until you stop the program.

When you select and run REVEIL.BA, line 10 sets up a 64 by 2 array to store all of the notes and duration values for the music. Line 20 branches to a subroutine at line 1000 that READs the DATA from lines 10000 through 11010 into the array. Lines 90 through 100 allow you to set the alarm for a particular time. Note that there is no error trap here; T\$ can be anything you type, but the wake-up time must be entered as HH:MM:SS for the alarm to work, so enter the time carefully.

The heart of the program lies in lines 105 through 900. Line 105 keeps

updating the display with the current time, providing the *clock* function. Line 110 continually compares the Model 100's inner clock time to the

**First, the program
prints an insulting
message for you
to read when
you get up**

wake-up time in the string variable T\$. If there is a match, the program branches to line 900, otherwise it loops back to line 105.

The actual *alarm* function begins in line 900. First, the program prints an insulting message for you to read when you get up, then it branches to the musical note sounding routine that starts at line 2110. This routine refreshes the clock display so that you will know how much you've over-slept, and plays the notes in line 2200. To change the tempo at which Reveille is played, increase or decrease the last number in line 2200. Increasing the value will slow the music down and decreasing the value will make it play faster. Line 2300 makes the music repeat by looping back to line 2110. The notes to Reveille and the duration of each are contained in the DATA statements of lines 10000 and on. The larger num-

```

1 '*****
2 '*
3 '*          REVEIL.BA
4 '*          By Richard D. White
5 '*          FEB. 2,1988
6 '*
7 '*****
8 REM **** Initialize program ****
9 CLS:PRINT @ 135,"REVEILLE!"
10 DIM A(61,2)
20 GOSUB1000
30 REM **** Set the alarm and display clock. ****
90 CLS:PRINT @ 130,"";INPUT"Set alarm at";T$
95 CLS
100 PRINT @ 130,"ALARM SET AT: ";T$;
102 REM **** Main loop starts here. ****

```

continued

Listing 1. Reveille, as performed by the Tandy 100/102 and 200 computer.

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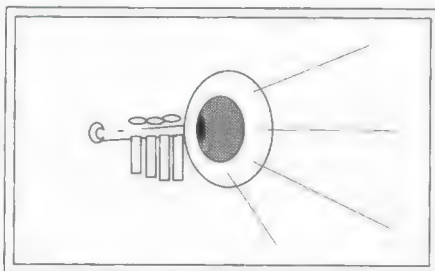
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bers are the pitch and the smaller ones are the duration. The routine in line 2200 makes the note *SOUND* by first getting the pitch in array variable *A(N,1)*, then the duration in array variable *A(N,2)*.

Remember, eight hours of operation will put a lot of drain on your batteries, so it's probably wise to use an external power supply or to put fresh batteries in the computer just before you start to run the program. You get K.P. if you let your batteries run down. Lights out, soldier, and don't forget to set your alarm for Reveille at 06:00:00 hours!



```

105 PRINT @ 217,TIME$
106 REM **** Compare clock to alarm setting. ****
107 REM **** If time, do alarm routine. ****
110 IF TIME$ = T$ THEN 900
112 REM **** If not, loop back. ****
120 GOTO 105
130 REM **** Alarm routine. ****
900 CLS:PRINT @ 134,"GET UP, DUMMY!";:GOTO2110
990 REM **** This subroutine READS notes and duration into array. ****
1000 FOR X = 0 TO 61
1050 FOR Y = 1 TO 2
1100 READ A(X,Y)
1200 NEXT Y:NEXT X
1400 RETURN
2100 REM **** This routine sounds notes. ****
2110 FOR N = 0 TO 61
2200 PRINT @ 217,TIME$;:SOUND A(N,1),A(N,2)*2
2220 NEXT N
2300 GOTO 2110
9999 REM **** Notes and duration values for "Reveille". ****
10000 DATA 4184,4,3134,4,2484,2,3134,2,4184,4
10100 DATA 4184,4,3134,4,2484,2,3134,2,4184,4
10200 DATA 4184,4,3134,4,2484,2,3134,2,4184,4
10300 DATA 3134,4,2484,8,3134,4
10400 DATA 4184,4,3134,4,2484,2,3134,2,4184,4
10500 DATA 4184,4,3134,4,2484,2,3134,2,4184,4
10600 DATA 4184,4,3134,4,2484,2,3134,2,4184,4,4184,4,3134,8,0,8
10800 DATA 2484,4,2484,4,2484,4,2484,4,2092,8,2484,8
10900 DATA 2484,4,3134,4,2484,4,3134,4,2484,8,3134,8
11000 DATA 2484,4,2484,4,2484,4,2484,4,2092,8,2484,4
11010 DATA 4184,4,3134,4,2484,2,3134,2,4184,4,4184,4,3134,8,0,32
11020 END
  
```

Program Listing for REVEIL.BA

End of listing



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The Model 2000 will tell.

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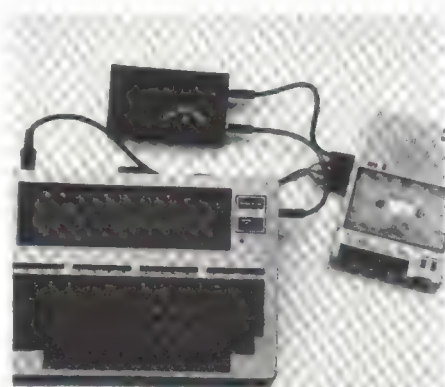
For further information, contact Vertox Company, 10022 Imperial Avenue #E, Garden Grove, CA 92643 (714)530-4541. Or circle #71 on your Reader Service Card.

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The *Hot Box* and *Super Hot Box* are rechargeable batteries housed in cases fabricated from mar-resistant engraving plastic. The *Hot Box* will operate a Model 100 for 40 hours, and the *Super Hot Box* will run a Model 100 for 80 hours. Either battery will recharge with the computer's AC adapter, and can be recharged while operating the computer. Two power plugs are provided for battery charging during use, or for operating a tape recorder or disk drive simultaneously with the computer. Up to 2000 partial recharge cycles are possible. The batteries are available in red, black or walnut wood grain finish.

The *Hot Box* price is \$59.95, the *Super Hot Box* price is \$79.95. Prices include two eight-inch cables with each battery. For further information,

contact Gnome Enterprises, 6145 Quail #210, El Paso, TX 79924 (915)755-1525. Or circle #70 on your Reader Service Card.

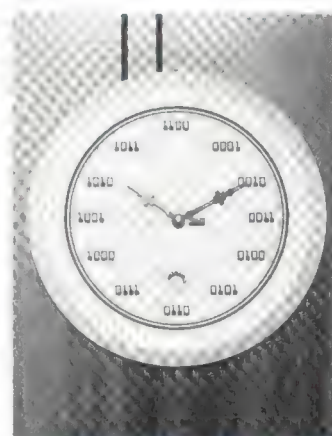


The *Hot Box* (center top) can provide power for a computer for up to 40 hours per charge.

It's 0101 And Time To Go Home

Sunrise Computer Products has introduced the *Binary Clock*, a sure-fire conversation piece. The numerical system of this 12-inch-diameter clock is in binary digits. It features a super-precision quartz movement which is guaranteed not to gain or lose more than two minutes per year, and it runs on one AA battery.

The color is light beige with binary digits in black. Retail price is \$34.95 plus \$3.00 shipping & handling. For further information, contact Sunrise Computer Products, P.O. Box 709, Kenilworth, NJ 07033. Or circle #69 on your Reader Service Card.



It's 1010—do you know where your programmer is?

And Now, A Brief Puzzle

Hardware-Software Integrations and Tri-Mike Network East have released *XVI*, a computerized puzzle for the TRS-80 Model 100, 102, 200, and NEC PC-8201A. The program, a simulation of the popular "16" game in which the player must arrange fifteen scrambled letters in alphabetical order on a 4-by-4 grid, uses a new assembly language technique developed by Tri-Mike Network East.

XVI loads and runs just like a BASIC program, but is machine-language. It's simple to play—just move the pieces around the grid with the arrow keys. You can scramble the puzzle at any time by pressing a key. For the terminally frustrated, there's even a key that solves the puzzle. The state of the game is automatically saved on quitting, so you'll always resume right where you left off. At 718 bytes, *XVI* is small enough to

leave in the computer all the time—a perfect way to enjoy wasted minutes in airports, waiting rooms, etc.

Price is \$19.95 plus \$1.50 shipping and handling. For further information, contact Hardware-Software Integrations, 415 South Monroe Street, Suite 108, P.O. Box 2151, Monroe, MI 48161 (313)243-5320. Or circle #62 on your Reader Service Card.

Displaying Three Banks At Once

Editors Note: This is part two of a series of three articles. Unfortunately, part three was run in the April issue, sort of our little April Fools joke on ourselves. But for those of you who want the missing piece, here it is!

In the March issue I discussed the significant aspects of customizing your Tandy 200, giving details on how to activate the unused function keys at the Tandy 200 menu. I also demonstrated the concept by adding F2 for reverse bank switching. In this issue I will discuss the addition of F7, which will display files in all three RAM banks at once.

If you missed the March issue,

have no fear. The current assembly listing is complete, but you should look for the previous issue if you want additional details about the relocation techniques and some insight as to the overall approach.

Before installing this month's program code for the function keys, remember to prepare LOMEM. The code is designed to run at RAM address A001H.

RAM memory begins at address A000H, but we can trick the T200 into thinking the RAM begins at A100H and the 256 bytes of RAM, from A000H to A100H will be at our disposal. It will be protected from the operation system and is perfect for

our needs.

To adjust LOMEM we must start with a completely empty bank. Cold starting a RAM bank is the quickest way to accomplish this task. Next we must load, copy, or type in the following TEXT file.

```
1 KILL "LOMEM.DO"
2 N=1:AD=40960
3 POKE AD,N
4 POKE AD+256*N,0
5 POKE 62703,160+N
6 NEW
```

This must be a TEXT file, NOT a BASIC program, and this TEXT file must be called LOMEM.DO. The variable N in line 2 is set for the number of 256 byte blocks you wish

```
0 CLS: CLEAR 256, 60000
1 FOR I=60000 TO 60278
2 PRINT@50, I: READ X: POKE I, X: SM=SM+X
3 NEXT
4 IF SM=33318 THEN CALL 60000
5 BEEP: PRINT "error in data": STOP
100 DATA 195, 71, 235, 42, 13, 245, 17, 61
101 DATA 160, 223, 202, 164, 103, 34, 102, 160
102 DATA 235, 34, 13, 245, 195, 164, 103, 66
103 DATA 97, 110, 107, 32, 66, 97, 99, 107
104 DATA 32, 32, 32, 32, 32, 32, 67, 111
105 DATA 112, 121, 32, 75, 105, 108, 108, 32
106 DATA 32, 32, 32, 32, 32, 70, 105, 108
107 DATA 101, 32, 32, 32, 32, 32, 0, 245
108 DATA 197, 213, 229, 56, 10, 237, 17, 188
109 DATA 104, 223, 194, 97, 160, 205, 150, 79
110 DATA 33, 21, 160, 205, 204, 17, 58, 12
111 DATA 253, 254, 64, 202, 104, 160, 254, 2
112 DATA 202, 213, 160, 225, 209, 193, 241, 195
113 DATA 168, 156, 205, 77, 79, 6, 0, 205
114 DATA 132, 160, 6, 4, 205, 132, 160, 6
115 DATA 8, 205, 132, 160, 175, 50, 30, 253
116 DATA 205, 247, 18, 195, 164, 103, 33, 181
117 DATA 242, 205, 30, 0, 205, 208, 160, 254
118 DATA 255, 204, 62, 79, 202, 62, 79, 230
119 DATA 128, 194, 161, 160, 17, 11, 0, 25
120 DATA 195, 138, 160, 35, 35, 35, 205, 208
121 DATA 160, 254, 32, 202, 173, 160, 231, 62
122 DATA 5, 167, 202, 186, 160, 61, 50, 174
123 DATA 160, 195, 163, 160, 62, 46, 231, 35
124 DATA 205, 208, 160, 231, 35, 205, 208, 160
125 DATA 231, 62, 5, 50, 174, 160, 35, 195
126 DATA 135, 160, 205, 177, 155, 122, 201, 243
127 DATA 219, 216, 198, 4, 230, 12, 254, 12
128 DATA 202, 216, 160, 71, 195, 105, 155, 1
129 DATA 228, 0, 33, 99, 234, 17, 1, 160
130 DATA 205, 22, 131, 6, 22, 17, 97, 235
131 DATA 33, 69, 241, 205, 186, 65, 195, 1
132 DATA 160, 72, 111, 111, 107, 24, 67, 97
133 DATA 108, 108, 52, 48, 57, 54, 49, 13
134 DATA 0, 69, 100, 105, 116, 32, 0
135 REM END OF DATA
```

Listing one. The BASIC code for Reverse Bank Switching and Getting the Free RAM available in all three banks.

With *LOMEM.DO* as the only file in the RAM bank, enter *BASIC* and *RUN LOMEM*. This program will end with a *SYNTAX* error but that is correct. At the *OK* prompt type *NEW* <CR> (Note: this is very important). Now there should be no syntax error. When you return to the Menu *LOMEM.DO* will no longer be there and the *Bytes Free* message will be 19334 (19590 - 256). We now have a place to store and execute the code for our keys.

It wasn't too difficult coming up with ideas for useful function key definitions. Here's another of my favorite routines: to view all RAM files at once, regardless of which bank you are in.

To accomplish this you must be able to *PEEK* into the directories of each bank, and display the filenames of valid files.

All of the function keys can be read at the keyboard buffer location *FDOCH* (64780) and the insertion of

CPI 64 will test for *F7* just prior to testing for *F2*. If *F7* is detected then the screen will blank, and all files in bank #1 are displayed, followed by a blank line. all files in bank #2, and blank line, and all files in bank #3. The program then waits for a keypress, then returns to the menu. You know what files are in which bank, and can still use *F1* or *F2* to change banks.

PEEKing into the directories of other RAM banks, or any address of any bank, and making that data byte available to the currently running program code, is done easily with a ROM call.

With these routines you can effectively *POKE* or *PEEK* any RAM address in any bank. Since the code is in *ROM*, the switching of RAM banks has no effect on program execution. The *ROM CALL* always restores the original bank before returning to the running program in RAM. Here are the conventions...

Register B hold the RAM bank to

access: 0 = bank #1; 4 = bank #2; 8 = bank #3.

Register *HL* holds the address to be *POKED* or *PEEKED*.

Register *D* holds byte to *POKE* (Register *D* returns with the byte *PEEKed*).

When the above conventions are set up, execute a *CALL 9BBOH* to do a *POKE* and execute a *CALL 9BB1H* to do a *PEEK*.

Our use of these *ROM CALLs* is just to retrieve data, but knowing these rules will allow you to study the code in listing two with a better understanding of the *ROM CALL* register setup (see subroutine *S FILE*).

The *BASIC* program in listing one will poke the code into memory, maintain a checksum for data accuracy, and execute the code if all is correct. Whether you use the *BASIC* program or the assembly source code, be sure to run *LOMEM.DO* first.

-by Paul Globman

```

;*****
;* LOWMEM HOOK CODE BY P.GLOBMAN *
;*          Copyright (C) 1987      *
;*****
X:      EQU 60003-A001H ;CALC OFFSET
CLS:    EQU 4F4DH
CRLF:   EQU 4F3EH
GONE:   EQU 9CA8H
HOOK04: EQU F50DH
MENU:   EQU 67A4H
POINT:  EQU 4F96H
PRINT:  EQU 11CCH
WAIT:   EQU 12F7H

;
      ORG 60000
      JMP START          ;TO RELOCATOR

;
LOADER: LHL HOOK04      ;ORIG. JUMP
        LXI D,HOOK-X    ;ADES OUR HOOK
        RST 3           ;CMP HL - DE
        JZ MENU         ;ALREADY THERE
        SHLD BYTE+1-X   ;BYTE+1=OLD HOOK
        XCHG
        SHLD HOOK04     ;HOOK=OUR CODE
        JMP MENU

;=====
LABEL:  DB 'Bank Back'      Copy
        DB 'Kill'          File      ',0
;
HOOK:   PUSH PSW          ;SAVE ALL REG
        PUSH B
        PUSH D
        PUSH H

;
        DESP 10          ;LOOK AT SP 10
        LHLI
        LXI D,68BCH
        RST 3           ;CMP TO 68BCH
        JNZ DONE-X      ;IF EQ->AT MENU
;
;AT MAIN MENU
;
        CALL POINT      ;PRINT LABEL
        LXI H,LABEL-X   ;LINE ON THE
        CALL PRINT      ;MAIN MENU
;
        LDA 64780        ;CHECK LAST KEY

```

```

CPI 64
JZ S_FILE-X          ;IF F7 -> S_FILE
CPI 2
JZ BNK-X             ;IF F2 -> BACK

;
DONE:  POP H          ;ELSE RESTORE
        POP D          ;AND EXIT
        POP B          ;BYE+1 (GONE)
        POP PSW        ;is altered by
BYE:   JMP GONE        ;loader subrtne
=====
S_FILE: CALL CLS        ;SHOW ALL FILES
        MVI B,0         ;FIRST BANK
        CALL BANK-X
        MVI B,4         ;SECOND BANK
        CALL BANK-X
        MVI B,8         ;THIRD BANK
        CALL BANK-X
        XRA A
        STA 64798       ;0 keystrokes
        CALL WAIT
        JMP MENU

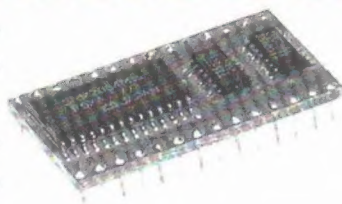
;
BANK:  LXI H,F2B5E      ;USER FILE #1
S_LOOP: CALL 1EH        ;PRINT SPACE
S1:    CALL GET_B-X     ;ATTRIB BYTE
        CPI FFH         ;NO MORE FILES
        CZ CRLF        ;THEN RETURN
        JZ CRLF
        ANI 80H         ;ACTIVE FILE?
        JNZ FILE-X      ;YES-SHOW IT!
        LXI D,11        ;NO-GET NEXT
        DAD D           ;FILE SLOT AND
        JMP S1-X        ;DO IT AGAIN!

;
FILE:  INX H            ;SKIP ATTRIB
        INX H            ;BYTE AND ADDRESS
C_LOOP: INX B
        CALL GET_B-X    ;GET FILENAME
        CPI ' '         ;SKIP SPACES
        JZ SKP-X
        RST 4           ;PRINT FILENAME
SKP:   MVI A,5          ;ANY MORE CHRS?
        ANA A
        JZ C_DONE-X     ;NO-THEN DONE
        DCR A           ;ADJUST COUNTER
        STA SKP+1-X     ;STORE IT AND
        JMP C_LOOP-X    ;GET NEXT CHR

```

Listing 2. The assembly language source code for the Reverse Bank switching and retrieving the available free RAM in all three banks.

EXPANSIONS!!!

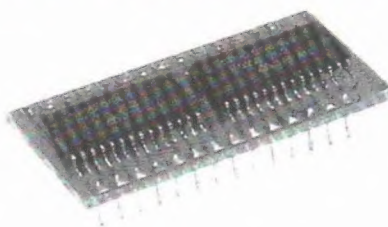


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